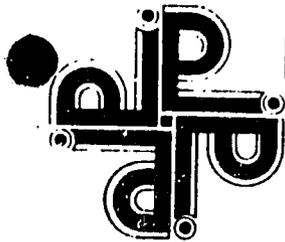


~~Department~~

PN-AAIC-988



Postharvest Institute for Perishables

Project Identification Study of
Fruit and Vegetable Production and Marketing
in the Northwest Frontier Province of Pakistan

A Consulting Team Study for the Agency for
International Development, Pakistan

Prepared by

E.N. Tony Babb, Development Alternatives, Inc.
Charles W. Peters, Agri-Food Systems International, Inc.
James K. Ballard, Postharvest Institute for Perishables
Ronald D. Morse, Postharvest Institute for Perishables

GTS Report 82-04
May, 1982



University of Idaho

in cooperation with
**United States Agency for
International Development**

Project Title: Storage and Processing of Fruits and Vegetables
Project No. AID/DSAN-CA-0265
Washington, D.C., U.S.A. 20523

PROJECT IDENTIFICATION STUDY OF
FRUIT AND VEGETABLE PRODUCTION AND
MARKETING IN THE NORTHWEST FRONTIER PROVINCE
OF PAKISTAN

A Consulting Team Study for The Agency for International
Development, Pakistan

POSTHARVEST INSTITUTE FOR PERISHABLES
DEVELOPMENT ALTERNATIVES, INC.
AGRI-FOOD SYSTEMS INTERNATIONAL

May 6, 1982

TABLE OF CONTENTS

	Page
I. Introduction	1
II. Description of Current Situation	6
III. Analysis of Constraints	12
IV. Potential for Development	16
V. Proposed Project for FVDB	20
VI. Proposal for Baluchistan	27
VII. Scope of Work for Project Paper Design Team	28
VIII. Issues for Design Team	32

ANNEXES

- A. Strategy for Improving Yield and Production of Vegetables in the NWFP of Pakistan
- B. Pakistan Tree Fruit Report
- C. Quetta Report
- D. Consultants Report on Fruit and Vegetable Marketing in Pakistan
- E. List of References
- F. List of People Interviewed and Itinerary

I. INTRODUCTION

A. Background of Study

The USAID Mission to Pakistan is preparing a major project in agriculture production, distribution and storage with a primary emphasis on the North West Frontier and Baluchistan Provinces. The Government of NWFP has decided to create a fruit and vegetable development board. The board will begin operations on July 1, 1982 at the beginning of the fiscal year. USAID/Pakistan was asked by the Government of NWFP to provide assistance for the formation and operation of the board. The responsibility of the board will be broad, to include all functions of research, extension, training, credit, marketing and institutional development. The board will have broad policy, coordination and directive authority but implementation will be in the hands of various government units, private enterprises and perhaps cooperative organizations.

The mandate of the board falls within the scope of objectives of the USAID project. Therefore USAID decided to consider assistance.

USAID requested the Postharvest Institute for Perishables (PIP) to undertake a preliminary study of the production and marketing of fruits and vegetables and the potential for development. PIP is an institute at the University of Idaho which receives major funding from A.I.D. on a cooperative agreement to work on post-harvest problems in developing countries. The study team was fielded by PIP and two sub-contractor firms, Development Alternatives Inc. and AgriFood Systems, Inc. The USAID requested a four person team for three weeks to carry out the following scope of work:

Best Available Document

1. Study and recommendation on the organization and management of a regional marketing board for fruits and vegetables. The team will examine possible mechanisms to facilitate the establishment of the board with suggestions for appropriate roles for government and private sectors.
2. Examine existing marketing system and the storage, processing, handling, packaging, and transportation facilities and assess current and potential utilization and improvements of these systems within the framework of the proposed marketing board.
3. Study existing government and private sector organizations in terms of their role in the production and marketing of fruits and vegetables. Institutions covered by the survey would include: 1) agricultural research and extension services; 2) credit services; 3) input supply services, 4) cooperatives; 5) private and government owned marketing, storage, transport and processing organizations.
4. Identify existing crops which have the greatest potential for market development under the proposed board.
5. Identify problems and constraints on the production side and points of greatest postharvest losses. Factors such as varieties appropriate for storage and transport, quality and grade standards, seasonal variation of cropping patterns and surpluses will be considered.

6. The team will develop a strategic plan for the development of the marketing board with recommendations for implementing efficient postharvest systems that will produce minimum losses and insure quality maintenance of the important perishable crops.
7. The team will prepare the final report in a manner which will facilitate its use as a basis for a PID and which will be most useful to the USAID.
8. The team will suggest further detailed studies which will be identified as necessary for the further development of the recommendations into a Mission project.

C. METHODOLOGY

The team conducted the study by: 1) reviewing the relevant literature on the subject available from the USAID library and government sources, 2) traveling to the fruit and vegetable areas of NWFP, 3) interviewing researchers, extension agents, farmers, food processors, cold storage operators, brokers, wholesalers and retailers, 4) interviewing Government of Pakistan officials in Islamabad and Karachi. The full itinerary and list of people interviewed are included in annex F. Two members of the team also visited Quetta, Baluchistan Province for a two day visit of fruit and vegetable areas and visits with government officials.

D. TEAM MEMBERS

1. E.N. Tony Babb, Agricultural Project Management Specialist. Team leader and focus on agro industry and institutional development.

2. Charles W. Peters, Agricultural Economist. Emphasis on marketing policies, prices, and organization.
3. James K. Ballard, Horticulturist. Emphasis on fruit production and handling, research and extension of fruit crops, with particular emphasis on apples.
4. Ronald D. Morse, Horticulturist. Emphasis on vegetable production and handling, research and extension of vegetable crops, with special attention to tomatoes and potatoes.

E. ACKNOWLEDGEMENTS:

The team wishes to acknowledge the strong support and cooperation of the many USAID and Government of Pakistan officials. We particularly wish to acknowledge the help of Mohammed Suleiman, who escorted us on our tour of NWFP. His knowledge of agriculture and experience in the region made the trip especially enlightening and productive.

COUNTRY DATA

		<u>PAKISTAN</u>	
Land Area (Thousand Sq. Km.)			
Total		803.9	
Agricultural		253.0	
Population (Millions--mid-1980)			
Urban Population		81.3	
Population Density		27.4	
Annual Growth Rate		96.0	
Annual Urban Growth Rate		3.1	
Crude Birth Rate (Per Thousand)		4.4	
Crude Death Rate (Per Thousand)		42.9	
Infant Mortality (Thousand Live Births)		13.0	
		105.00	
Life Expectancy at Birth (Years)		52.0	
Access Safe Water		29.0	
Access Excreta Disposal (Population)		6.0	
Population Per Physician		5,257.0	
Adult Literacy Rate (Population)		24.0	
Primary School Enrollment (%)		54.0	
Gross National Product			
Total			\$25 Billion
Per Capita			\$280.00
Percent Agriculture Sector			30%
Value Added	(Million U.S.\$)	%	V.A. Per Worker
Agriculture	6,700	31	\$U.S. %
Industry	5,300	25	523 58
Services	9,300	44	1,228 137
			<u>1,409 157</u>
TOTAL/AVERAGE	21,300	100	898 100
Total Labor Force (Thousands)			23,700.00
Female			10.0
Agriculture			54.0
Industry			18.0
Absolute Poverty Income Level (Dollars Per Capita)			
Urban			176.0
Rural			122.0
Population Below Absolute Poverty Income Level			
Urban			32.0
Rural			29.0

From World Bank Figures

II. DESCRIPTION OF CURRENT SITUATION

A. Soils, Climate, Topography

The North-West Frontier Province is a distinctly different geographic area from the broad Indus Plain of central and southern Pakistan. The region is best described by starting in the north with the massive Hindu Kusch range with rugged glacial peaks in excess of 20,000 feet. Other ranges, still of substantial elevation and ruggedness branch off like fingers of a hand through the region. The valleys between the ranges start with narrow gorges and work down through broader river catchments to substantial alluvial basins and on, in a few cases, to fairly extensive flood plains. The abundant water of the region flows to the Indus but not without first providing an adequate supply (or availability) for the irrigation systems and other needs of the river valleys.

The soils are generally of good agricultural quality in these valleys. They are deep, well-drained alluvial silt and sandy loams with good water holding capacity and a 7.0-7.5 pH. Nitrogen and phosphorous are generally required for good yields. Potassium is apparently not a limiting factor. Very little work has been done on micronutrients and deficiencies may exist for certain crops. Some of the mountainous areas have extremely rocky soils.

Annual precipitation ranges from a low of 10 inches in the southern districts to over 50 inches in the higher elevations of the north. Winter snowfall in the high mountains feeds the numerous rivers of the province which provide irrigation water in the valleys and basins where the bulk of commercial fruits and

Vegetables are produced. Temperatures also vary widely among the districts. Winters are cold and summers warm temperate but periods of high temperatures (over 90°F) are common in the valleys. Generally, the climate of NWFP is near ideal for horticulture if appropriate species and varieties are selected for specific locations.

B. Infrastructure

1. Transport. The major growing areas have access to market by all-weather roads. A number of remote areas of the Province could become commercial fruit and vegetable producers if they had road access to market centers. The region is connected to the major markets of central and southern Pakistan by a paved highway system and a railroad. Produce is transported primarily by truck to urban markets.

2. Market Facilities

The major produce market of the region is in Peshawar but some produce moves directly from the farms and villages to its final destination. The Peshawar market facility consists of two (one for fruit, one for vegetables) large "courtyards" surrounded by office stalls for the commission agents and contractors. Produce is unloaded from trucks and auctioned in the courtyard. There are no grading facilities and produce is taken "field-run" on inspection. These markets have the appearance of chaos but somehow seem to get the job done.

C. Agricultural System

Research, Extension and Education are each separate functions in the Pakistan system. Research farms in Peshawar and Swat are inadequate but lacking in certain laboratory and field equipment. The Extension Service lacks a direct linkage with research and the resources to conduct adequate field demonstrations and farmer training. Education in the colleges and university is not linked to the Research and Extension programs. Opportunities for improving applied technology through short-term training abroad are not generally available. A number of highly qualified and motivated researchers and extension agents would be able to make a much greater contribution to horticultural development if they had some specialized short-term training and exposure to improved practices of horticulture production.

Medium-term credit for farm development -- leveling, orchard planting, etc. -- is available with the land itself as collateral. Short-term production loans are not easily obtainable and most farmers of fruit and vegetables rely on traditional money lenders and produce buyers for advances. There are practically no cooperative credit programs in NWFP.

Fertilizer is generally available and has been subsidized in recent years, although use on all crops is comparatively low. Availability of appropriate pesticides is spotty and it was reported that many were of poor quality or not as labeled.

Tractors and implements are readily available and are increasingly in use by larger farmers, about 4,000 in 1981. Custom tractor work is becoming common but the vast majority of farmers use traditional plows and buffalo.

At the present time there is no parastatal organization directly involved in horticulture production or marketing with the exception of one relatively small government-owned cold storage facility in Peshawar and one in Swat.

There are seven or eight privately-owned food processing factories in Peshawar. They are all small, using antiquated equipment, and produce small quantities of products for the domestic market. They can fruits and vegetables, and bottle squashes and fruit drinks. Costs of containers and sugar put the price of these items out of reach of all but the more affluent consumers in Pakistan. They are even less competitive in light of the availability of fresh produce the year around. These factories do not produce a high enough quality to compete in international trade.

D. Crops Produced

The NWFP grows a wide variety of annual and perennial crops (see Table 2). Detailed listings of fruits and vegetables grown are included in Annexes A and B. The farms are small and diversified. Intercropping of vegetables and livestock forage in the orchards is widely practiced. Yields are generally on the low side but experimental farms and progressive farmers have obtained very good yields of most crops. The market for fruits and vegetables is growing yearly and the farmers are enthusiastic about the potential for increasing cash income. Apple is the major fruit crop and new plantings are up considerably in recent years. In 1980, for instance, 321,000 young trees were distributed to farmers by the government nurseries. Increases in production of fruits and vegetables are expected to continue until the market supply forces a price reduction.

TABLE 2
NWFP DATA

POPULATION

Population NWFP	11 million
Percent urban	15%
Growth rate	3%

FARMS

Total number	650,000
Area in fruit*	15,000 ha.
Production of fruit	160,000 M.T.
Area in vegetables	30,000 ha.
Production of vegetables	350,000 M.T.
Number of tractors	4,482
Average size farms	2 ha.

* Detailed listings of crops by area and production can be found in Annex for fruits and Annex for vegetables.

TABLE

MAJOR CROPS OF NWFP 1980

<u>Kharif Crops</u>	<u>Area</u> (000 ha.)	<u>Production</u> (000 M.T.)
Maize	348	438
Rice	67	105
Jawar (sorghum)	31	15
Bajra (millet)	23	10
Sugarcane	87	3417
Tobacco	31	51
Fruits	129	1406
Vegetables	161	2231
 <u>Rabi Crops</u>		
Wheat	745	811
Gram	115	20
Barley	55	44
Rape and Mustard	43	21
Fruits	47	407
Vegetables	59	793

III. ANALYSIS OF CONSTRAINTS

- A. Agroclimatic. There are no major agroclimatic constraints to the production of fruits and vegetables in NWFP. By proper selection of species and varieties for each agroclimatic zone nearly all types of horticultural crops can be successfully produced.
- B. Demographic. The province is not densely populated although arable land per capita is small. Labor-intensive horticulture is well suited to the area for employment generation. The 3% population growth rate presents a problem in terms of further subdividing farms and in terms of capital investment requirements for physical and social infrastructure over the next 20 years. Maintaining the current level of health, education, transportation and other services will severely strain the government budget and limit expenditures for development.
- C. Technology. Yields are considerably below potential for a variety of factors:
1. There is no certified seed program for vegetables. Varieties are mixed, viability is low and production suffers. Tree nurseries do not control for virus and appropriate root stock is not always used.
 2. Vegetable varieties are limited and many more are needed for the different seasons and agroclimatic zones. A large number of fruit varieties are being tested but some recently released new varieties are not yet introduced.

3. Intercropping vegetables and forage crops with fruit trees limits the yield of fruit. Research is clearly needed on these systems to arrive at optimal practices for total output of farm units. More knowledge is needed on the soil nutrient and plant relationships in these systems.

D. Market Systems. The system for marketing fruits and vegetables is clearly a constraint on profitability and production. Farmers are not organized and do not have current information on market supply and prices. The brokers and commission agents are organized and have a clear advantage on information. Ministry of Agriculture economists reported that many farmers barely earn wages on perishable crops. In the absence of alternative employment opportunities this is sufficient to continue producing but not sufficient to encourage use of yield increasing inputs like fertilizer and pesticides. For instance, apple farmers sell their crop to a contractor when it is in bloom. They get a cash advance (usually one-third) with the balance paid when the crop is taken off. The farmers have no incentive to spray during the fruiting period.

Without grades and standards and a corresponding pricing system there is no incentive to grow quality produce which could command a higher price and be acceptable in the more profitable export markets.

The cold storage of apples, citrus, potatoes and some other commodities prolongs the market season and greatly increases the price obtainable in the main consumer markets. Dealers and wholesalers do the storage so the farmer's benefit from the extended market is limited.

- E. Prices. There are no controls on farm prices of produce so it is a free market system. The farmers do not take full advantage of their supply position to bargain for higher prices. Nevertheless, farmgate prices at present levels seem to be sufficient to encourage continued increases in production. Increased farm productivity would return a higher net profit to farmers and create further incentives for increased production.
- F. Input Supply. Fertilizer is available at subsidized prices which are comparable to world prices. Pesticides are available but the quality and appropriate types are not always used. Farmers have become discouraged with the use of chemicals because they have not been getting the results intended.
- G. Credit. The production and marketing of fruits and vegetables occurs under the existing system without an organized production credit program. Farmers finance themselves, borrow from family members or members of their village, or from traditional money lenders and produce buyers. The Extension Service reported that farmers do not use as much fertilizer and pesticide as they should because of the cash outlay requirements. They do not store their own produce because they need cash immediately at harvest time. The practice of contract selling of apples in the bloom suggests a higher value on the cash advance than holding out until harvest to obtain a higher price.

We were told on numerous occasions that government and cooperative society production credit programs do not have a history of success in Pakistan and therefore, there is not much interest in creating such a program. Nevertheless, it appears inescapable that farmers must be able to finance production costs to increase yields and marketing costs to achieve some leverage on prices.

Medium-term financing for land development, equipment purchases and other capital development costs is readily available to landowners. This is not a constraint on development. Religious attitudes with respect to paying interest does prevent some farmers from availing themselves of lending services.

- H. Labor. There seems to be no shortage of farm labor even in the peak harvest periods. Apparently, workers are brought in from other areas if the local supply becomes tight. Given population growth rates, the problem seems to be primarily one of labor surplus.
- I. Investment Capital. Private capital for investment in food processing and marketing enterprises seems to be readily available. Pakistan is not short of entrepreneurs and the record of investment growth in agro-industry in recent years confirms that impression. Where proven technologies are available investment from private individuals and financial institutions, including foreign investments, appears at least adequate.
- J. Education Training. Specialized programs in horticulture at the universities and colleges are reported to be rather limited. Short-term training abroad in specialized fields of fruit and vegetable production are also very scarce. There are only a few appropriately trained horticulturists in NWFP research and extension programs. At present there are no organized, regular extension training programs for farmers. The absence of education and training programs is an important constraint on development.

IV. POTENTIAL FOR DEVELOPMENT OF FRUITS AND VEGETABLES IN NWFP

The scene is set for significant growth in the fruit and vegetable industry of NWFP. The province is well suited agroclimatically for horticulture. The soils are good and irrigation water is abundant. A basic transport structure and a traditional marketing system are in place. The foundation elements of a sound government research and extension service are functioning. Farmers in some districts have been growing fruits and vegetables for commercial markets for two or three decades; basic familiarity with the crops is there. Effective demand in the urban markets of Pakistan apparently is strong and expected to continue growing as incomes rise. Export opportunities are available for quality produce. Yields are relatively low by developed country standards, 50 percent or less. Farmers could greatly increase income on the same land area by adoption of improved technologies and inputs. Improvement of the farmers position in the market can also be achieved.

- A. Varieties. Vegetable varieties are quite limited. Many more varieties of most species should be tested and the appropriate ones released. Early and late varieties are needed to lengthen the marketing season. Disease and pest resistance are available in some species. Fruit varieties available and being tested are fairly extensive but a number of improved varieties and root stock could be introduced to improve production.
- B. Seed. There is tremendous potential for increasing farmers yields with a program to produce and distribute high quality, certified seed. NWFP is an ideal location to produce seed which could be sold all over Pakistan. Indeed, a good export market could probably be developed in time. Potato seed is another high potential item. It is imported now at great expense and could be grown in NWFP or Baluchistan. A seed industry could be developed in the private sector at minimal cost to the government.

C. Production Practices. A large number of production practices in fruits and vegetables could be adopted, each of which can marginally increase yield, collectively they would have a significant effect. Detailed discussion of production practices is included in annexes and A list of important practices includes:

For Vegetables:

Rate of planting
Depth of planting
Date of planting
Weeding
Disease/pest control
Fertilization (type/rate)
Proper irrigation

For Fruit:

Spacing
Training
Pruning
Intercropping
Disease/pest control
Fertilization
Proper irrigation

D. Improved Irrigation Practices. The flood irrigation methods now commonly practiced could be greatly improved with the introduction of controlled furrow methods, sprinklers and trickle systems. An on-farm water management program could eliminate considerable waste, improve timeliness and amount of water delivered to vegetable and fruit crops, and increase productivity. This is particularly true for farms that are pumping from tubewells or surface water. The whole future of agricultural development in Baluchistan depends on water management. There is a very high potential for development in Baluchistan with a comprehensive, long-term water management project. (See Section VI)

- E. Market System. The marketing system can be improved in a number of ways which would increase the development of the fruits and vegetables.
1. A market information system which regularly reported trends and prices would help farmers make decisions on what to produce at which time. It would put them in a better bargaining position vis-a-vis the dealers.
 2. Organization and management of the market centers could improve the efficiency of the handling of produce and reduce waste.
 3. Introduction of grades and standards would allow Pakistan to enter the export markets where returns are higher. Premium prices for high quality produce would be an incentive for farmers to produce a higher standard product. An impartial grading system would assure farmers of getting a better price for quality produce.
 4. Refrigerated transport could improve the marketability of scarce highly perishable items.
- F. Improved Processing. Marginal improvements might be made in the processing technology now employed but it is not clear that the domestic demand is sufficient to warrant the investment required to bring the industry up to quality standards. The industry seems to be satisfying demand for jams, squashes, sauces, chutneys, etc. Cost of tin-plate and sugar would have to be considerably lower before it would be possible to attract a larger domestic market or compete in export markets.

G. Export Promotion. There is strong potential for Pakistan to compete in the fresh produce markets of the Gulf countries. Deciduous fruits are now being imported by these countries from Europe, North America, and Australia. Pakistan's close proximity and lower labor costs should give it a comparative advantage, particularly for apples. Few areas in the region have the agroclimatic conditions to produce deciduous fruit on a par with NWFP and Baluchistan. Exporters do ship fresh fruit to the Gulf countries from time to time in small quantities and this trade could probably be expanded considerably with a promotional effort including grading and packing for high quality international standards and farmer incentives for producing export quality. It is doubtful that fresh vegetables could be exported in the region but there may be some crops in certain seasons which could be air freighted to the Gulf. This would be worth studying.

The processing industry of Pakistan is not in a position to compete in the export market. (See Section II G.) The one exception might be dehydrated potatoes and onions for the military in some countries in the region.

One product which might have good potential is concentrated fruit juice, especially apple juice. The Middle East countries are large consumers and there is potential in other Asian countries. A modern plant would be required to produce a high quality product to be shipped in 50 gallon containers to be reconstituted and bottled in places like Kuwait, Saudi Arabia and Abu Dhabi.

V. PROPOSED PROJECT FOR THE FRUIT AND VEGETABLE DEVELOPMENT BOARD OF NORTHWEST FRONTIER PROVINCE

A project is proposed to provide assistance to the newly created NWFP Fruit and Vegetable Development Board (FVDB). The FVDB, which officially begins operations on July 1, 1982, has complete authority for all government activities related to the development of fruit and vegetable production and marketing. The AID project will assist and support the FVDB in implementing its full responsibilities. The components of the project are:

- A. FVDB Organization and Management. Technical assistance in the form of contract advisors will be provided to establish the organizational structure and management system. The disparate functions of the FVDB will require substantial operational planning and a management system for the action programs. A management information system is required and coordination mechanisms are needed to assure effective implementation.

- B. Crop Production. Technical assistance will be provided for an integrated research, extension and training program in all aspects of fruit and vegetable production. Vegetable seed production, including potatoes, and fruit tree propagation is included in this component. The Ministry of Agriculture research and extension personnel in horticulture will work under the management of FVDB and the project will assist them in forming an effective integrated unit which will have the research, extension and training activities operating under single management with the same objectives and action program.

- C. Market Development. Technical assistance will be provided for developing the market system and expanding the markets for fruits and vegetables. A system for ongoing market analysis and reporting will be created. A market information program will be implemented to continuously inform farmers and others of market prices and trends, both domestically and internationally. A program will be implemented to organize the produce markets to function more efficiently and to reduce food waste which occurs through spoilage and damage in handling. Export opportunities will be continuously monitored and explored, and Pakistan produce aggressively promoted.
- D. Produce Grades and Standards. A technical assistance component will be included to assist the PVDB with short-term consultants and training to establish and manage a program of grades and standards for produce. Initially, a pilot activity will be undertaken to do grading on produce for the export market. Apples particularly will be emphasized.
- E. Cooperative Development. A U.S. cooperative development organization will be contracted to implement a program to develop one or two pilot cooperative marketing organizations. The marketing societies will be single crop marketing organizations with the objective of achieving higher profits for farmers by grading and packing, storage for extending the market period and stabilizing prices at higher levels, retaining some of the profit of the marketing functions, and promoting export sales. The greatest potential for cooperative societies is in apple, tomato, potato, onion, and vegetable seed, particularly potato seed.

The cooperative development program is a long-term activity which will emphasize training and management of the society as a business enterprise.

F. Vegetable Seed Program

PHASE ONE

A private U.S. seed company will be contracted to do a comprehensive study of the vegetable seed situation in Pakistan. The objective will be to: 1) determine the feasibility of private commercial seed production of high quality, 2) make recommendations for development of the government certification program, 3) design a program for long-term development of the seed industry, 4) recommend a program for promotion of joint ventures of U.S. and Pakistani seed companies, 5) make a separate proposal for development of the potato seed industry. The study will be conducted by one seed industry expert for one year, supported by several short-term experts during the year.

PHASE TWO

During Phase Two the recommendations and plans made under the first phase will be implemented. It is anticipated technical assistance will be required for the government seed certification program. Assuming positive recommendations in the feasibility study, AID will promote joint ventures and assist by providing long-term debt financing.

G. Concentrated Juice Production. A private U.S. company will be provided a grant to perform a feasibility study on the production and export sale of concentrated fruit juice, particularly apple juice. If feasible, the objective of this activity is to encourage the formation of a joint venture between a Pakistani firm and a U.S. firm to engage in the concentrated juice business. The feasibility study will examine supply of fruit, potential Middle East and other markets, operating costs, and capital requirements. A financial plan and projected return on investment will be prepared.

II. Participant Training. There will be a substantial participant training component for all aspects of fruit and vegetable production and marketing. Included in the list of possible trainees for both short and long-term training are the following subjects:

- Deciduous fruit production
- Vegetable production
- Integrated crop protection
- Vegetable seed production
- Farming systems research and extension
- Food processing technology
- Export market promotion/management
- Cold storage technology/management
- Market information systems
- Potato seed production/storage/distribution
- Business administration for agroindustry

I. Commodities. The various components of the project will require commodities for implementation. A representative list (to be completed in design of project) is as follows:

1. Vehicles for FVDB staff and advisors.
2. Laboratory and field equipment crop production research.
3. Field equipment and machinery demonstration and training activities.
4. Office equipment and supplies.
5. Food technology equipment for testing and training.
6. Seed laboratory equipment.
7. Cold storage equipment and machinery for demonstration and training.
8. Construction of facilities for branch research and extension activities.
9. Irrigation equipment for demonstration of trickle and sprinkler systems for fruits and vegetables.

- J. Cooperative Development Fund. A fund will be created with joint AID-GOP financing to provide operating capital to the pilot cooperative societies for such purposes as cold storage of produce or potato seed.
- K. Private Sector Loan Fund. A fund will be established with a Pakistani bank or group of banks for co-financing of private sector joint ventures of U.S. and Pakistani firms for food processing and seed production.

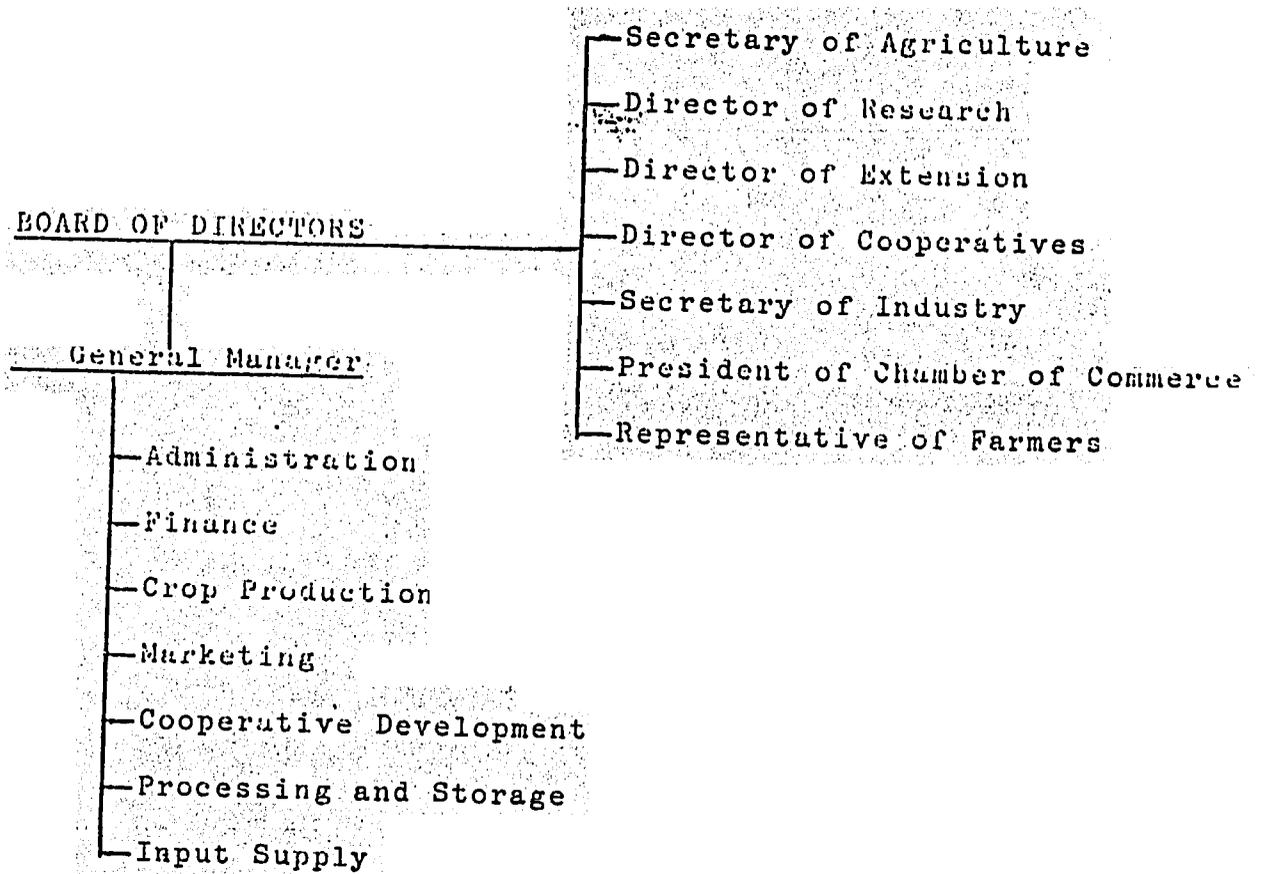
L. Proposed Budget Estimate:

1. Technical Advisors	
Long-term	\$ (Million)
3 x \$200,000 p.a. x 5 years =	3.0
Consultants	
30 person months x \$10,000 x 5 years =	1.5
2. Participant Training	
Long-term	
10 person years x \$20,000 x 5 years =	1.0
3. Commodities	
Vehicles	.4
Research/Extension	1.0
Food Technology	.3
Seed Laboratory	.3
Cold Storage	.3
Construction	.7
Irrigation	.5
	TOTAL
	3.5
4. Cooperative Fund	2.0
5. Private Sector Fund	4.0
	<hr/>
	Total Budget
	15.0

Organization of FVDB

The Government of NWFP has not made a final decision on the organization and management of the FVDB. From discussions with senior officials of NWFP the structure of the board will probably be something like the one shown in Table 3

TABLE 3



VI. PROPOSED PROJECT FOR BALUCHISTAN

A. Water. The potential for development of fruits and vegetables in Baluchistan will be determined by the appraisal of water resources. At present the water table in Quetta District is reported to be dropping at a rate of two or three feet a year. How serious that rate of decline actually is depends on the depth of the aquifer. It is a rechargeable strata and the heavy rain in the Spring of 1982 is reported to have raised the level by five or six feet. Apparently there are a large number of aquifers in northern Baluchistan in the various valleys but the full extent of water resources is not known. The potential for increasing the recharge rate of the aquifers with a catchment program is apparently quite good but has not been fully studied.

Management of existing water systems -- Karezes, tubewells, etc. -- could be improved greatly to conserve on water use. The predominant irrigation method is field flooding, clearly the most wasteful. Controlled furrows, sprinklers and trickle systems could be used on the horticulture crops with tremendous savings -- as much as 60 or 70% with good management.

B. Crops. Horticulture crop production could be increased greatly with the same type of research, extension and training program as recommended for NWFP. The basic government system exists but does not operate very effectively. A fruit and vegetable development authority should be considered to bring about a focus and coordination to efforts in horticulture production.

C. Recommendations.

1. A comprehensive water resources study is recommended for Baluchistan Province. The full potential for the area should be determined and a development plan created for water use and catchment work.
2. A technical assistance project for horticulture development should be designed including an on-farm water management program. Existing AID projects may be able to be utilized for the Baluchistan activity.

VII. SCOPE OF WORK FOR PROJECT PAPER DESIGN TEAM:

A. Technology Development

1. Conduct a detailed review of the horticulture research, extension and training activities in NWFP and design a program for strengthening those activities.
2. Review the physical facilities and recommend the land, building, equipment, machinery, instruments and other items required to implement a project.
3. Appraise the personnel resources of research, extension and training and design a participant training program to improve the qualifications of the staff to a level appropriate to the objectives and tasks of FVDB.

B. Marketing

1. Design a market information system for the FVDB to include regular data collection, analysis and reporting. Include a positive action program to inform farmers of market trends and prices.
2. Study the Middle East and other possible markets and determine actual potential for Pakistan fruits and vegetables. Design a program to produce the type and quality produce required, and a promotional program to market it.
3. Design a system of grades and standards for fruits and vegetables and a pilot activity to implement it for export crops.

C. Cooperatives

1. Appraise the farmer cooperatives in NWFP and the Cooperative Development group of the FVDB and determine the feasibility for undertaking a cooperative development assistance activity.
2. If feasible, design a program of technical assistance and training to implement any action.
3. Determine the financial requirements of a cooperative development program and design an activity for implementing a cooperative development fund.

D. Food Processing

1. Evaluate the operations and technologies of the food processing plants and, if feasible, design a project activity to improve their plant technology, quality of product, and marketing programs.
2. Conduct a prefeasibility study of the concentrated juice market in the Middle East and make a determination on whether or not a full feasibility study is justified.

E. Private Sector

1. Review the role of private companies in food processing and marketing and determine the feasibility of expanded investment and in joint ventures with U.S. firms.
2. If appropriate, design a project activity to encourage private sector investment and Pakistani-U.S. joint ventures.

VIII. EXPERTISE REQUIRED FOR DESIGN TEAM

1. Team leader: This person should be an experienced project designer with knowledge of agricultural production and marketing projects, and fully familiar with organization and management of parastatals.
2. Fruit horticulturist: This should be a senior specialist familiar with all aspects of deciduous fruit research and extension, heavy experience with apple is essential.

3. Vegetable horticulturist: A senior experienced scientist in vegetable research and extension is required.
4. Seed production specialist: A specialist in developing country vegetable seed production, including potato seed is required for a short-term study.
5. Food processing expert: Someone with extensive experience in fruit and vegetable processing industry in developing countries.
6. Fruit and vegetable marketing specialist: A person fully familiar with the practical aspects of fruit and vegetable marketing in Asia.
7. Cooperative development specialist: An experienced developing country cooperative development specialist familiar with all aspects of coop organization and management.
8. Cold storage expert: A technical expert on cold storage plant management.

SCHEDULE OF TEAM:

The specialists in seed production, food processing and cooperative development could all conduct their studies and prepare reports prior to the work of the main design team which would include the remaining specialists. These three would need two to three weeks each. The main team will require six to eight weeks to complete a project paper, although some individuals could complete their work in a shorter time if they did not participate in the drafting of full project paper.

VIII. ISSUES FOR DESIGN TEAM

- A. Can the new FVDB manage all of the functions and coordinate the various government and private organizations involved in the production and marketing of fruits and vegetables? Does it have the authority to implement its mandate, the professional staff to manage this size of effort, and the financial resources required?
- B. Is the control of fruit and vegetable markets by middlemen actually detrimental to increasing production and marketing? Can the system as it now exists be improved or should it be displaced by another system? Would direct government intervention in the market be beneficial or harmful?
- C. Is there a role for cooperatives in fruit and vegetable production and marketing? What functions can cooperatives effectively do, if any? Credit, input supply, storage, brokering?
- D. Are there significant Middle East or other export markets for fresh produce or processed products which Pakistan should be pursuing?
- E. Are GOP and financial institution policies sufficiently supportive of private sector investment in agro-industry to encourage Pakistani and U.S. firms to enter joint venture enterprises?

STRATEGY FOR IMPROVING YIELD AND PRODUCTION
OF VEGETABLES IN THE NWFP OF PAKISTAN

RONALD MORSE

CONSULTANT FOR USAID

VIRGINIA POLYTECHNIC INSTITUTE

BLACKSBURG, VIRGINIA 24060

APRIL 9 THROUGH MAY 4, 1982

STRATEGY FOR IMPROVING YIELD AND PRODUCTION
OF VEGETABLES IN THE NWFP OF PAKISTAN

RONALD MORSE
CONSULTANT FOR USAID
VIRGINIA POLYTECHNIC INSTITUTE
BLACKSBURG, VIRGINIA 24060
APRIL 9 THROUGH MAY 4, 1982

I. INTRODUCTION

This technical report discusses the current problems and potentials of the vegetable industry in the North West Frontier Province (NWFP) of Pakistan and suggests recommendations and personnel needed for improvement. This report is the vegetable production component of a short-term investigation of the production and marketing of fruits and vegetables in the NWFP. Similar technical reports were prepared by Mr. James Ballard on fruit production and Mr. Charles Peters on fruit and vegetable marketing. Mr. Eugene 'Tony' Babb, team leader, compiled the final report based on his own observations and the three technical reports formerly mentioned. The objective of our review team was to assess the fruit and vegetable industry in relation to a Fruit and Vegetable Development Board (FVDB) which has been proposed by the NWFP Provincial Government. Refer to the report by Charles Peters for more information on the FVDB.

II. PRESENT SITUATION

Per capita daily consumption of vegetables in Pakistan.

Daily use of vegetables and fruits are essential for a balanced diet. Per capita consumption of vegetables in Pakistan was 82 g in 1978-1979 (10) compared to 278 g in the United States (37). The goal of the People's Republic of China is to provide 500 g of vegetables per person per day (36). The present consumptive rate of vegetables in Pakistan is inadequate to meet the nutritional needs of the people (5, Vol. 15). Pakistan is abundantly blessed with a variety of soils and climates that can produce a plentiful supply of fresh vegetables throughout the year.

Farm size. Approximately 48% of the 650,000 privately owned farms in the NWFP are 2 ha or less (27). Although farm size is not broken down by commodity, the author believes the percentage of farms devoted mainly to vegetable production is nil. In general, vegetables are grown on small farms producing a variety of vegetables and fruit species or on larger farms that produce mainly agronomic crops with vegetables as a cash crop throughout the year. Thus, large farms devoted to a single or 2 or 3 vegetable species is uncommon in the NWFP. This lack of specialization is one possible reason why vegetable yields are typically lower than U.S. yields.

Soil, climate, and topography. Overall the NWFP has good soils, climate, and topography for growing most vegetables. Soils are sandy to silt loams with adequate fertility and water holding capacity. In general, the soils are 7.0 to 7.5 in pH requiring nitrogen (N) and phosphorous (P) but little or no potassium and micronutrients. Waterlogging, and salinity, which are serious problems in the other provinces, are not a major problem throughout most of the NWFP (5, Vols. 4-5). In the mountainous areas the soils are often very rocky which could be a possible problem for mechanical seeding operations.

Climatic conditions during most months are favorable for growing vegetables in the NWFP. Average maximum (day time) temperatures of 37-41° C occur in some districts during May, June and July (10). Of particular importance, the minimum (night time) temperatures average 25 - 27° C in these same areas. Fruit set and normal development of some fruit crops such as tomato are severely reduced if grown under these high temperature conditions. The NWFP is fortunate to have selected areas with mild temperatures that allow tomato production during months when hot temperatures inhibit economic tomato yields in other provinces.

Irrigation. Flat valley floors and terracing in the foothills and steep mountain areas provide a level terrain for irrigation of most vegetables. Available high-quality water for irrigation is a major factor that favors the NWFP for production of high-quality vegetables. Of the 701,000 irrigated ha in the NWFP, 87% of the water is derived from canals (10). Flooding or furrow irrigation are the methods used. All of the summer vegetables and 93% of the winter vegetables were irrigated in 1980-81 (Table I.) The percentage irrigated area of pulses is characteristically very low compared to vegetables. Only 6% of the area in chickpeas was irrigated although no data are available (Table I).

Level of mechanization. Tractor numbers in the NWFP increased from 1,570 in 1970-71 to 4,482 in 1979-80 (27). The latter number however only represents 0.7% of the farms on a simple one tractor per farm basis. Considering that some large farms had more than one tractor per farm, the actual figure would be less than 0.7%. Most farmers, however, have draft animals or access to them for preparing and working the land. Field planting is usually accomplished by hand seeding or setting home-grown transplants. Harvesting and hauling are done manually and the produce carried to wholesale markets by carts or truck. Main roads are adequate although they tend to be narrow and rough.

System for agricultural development in Pakistan. The system for improving agriculture in Pakistan is similar to most third-world countries -- research, extension and education exist but having no official linkages between them. A Fruit and Vegetable Coordinator functions in the Pakistan Agriculture Research Council (PARC) to establish and promote vegetable research throughout the country. He (Dr. Zahur Alam) is stationed at the National Agriculture Research Center (NARC) in Islamabad and coordinates programs in each province. For the NWFP, the Tarnab Agriculture Research Institute and six sub-stations each have ongoing research programs on vegetable crops.

Extension is separate from research but answers directly to the Secretary of Agriculture. The main problems in extension are (1) the agents or field personnel are not well trained and funded, (2) there is an acute lack of subject matter specialists, and (3) extension is not officially coordinated with research and thus the agents are not kept abreast of new technology and do not receive training from the more qualified and specialized research staff.

Educational institutions have no official association with either research or extension. The Agricultural University at Peshawar has capable personnel but little meaningful research is conducted by the Faculty. The PARC recently awarded 50 million rupees to the three Agricultural Universities in Pakistan (Peshawar, Faisalabad and TandoAdam) to strengthen and support research. This is encouraging and efforts to coordinate this research with the PARC and NARC would be a giant step forward.

Vegetable species. Table 2 contains a listing of 30 crops commonly grown in the NWFP. In some instances (e.g. the Cucurbits), two or more crops are believed to be the same species. This is by no means a complete list of vegetables grown in the NWFP; however it does represent the vast majority of the area planted each year.

During the past decade, the area planted in vegetables has increased by 70% in Sind, 31% in NWFP and 18% overall in Pakistan. Acreage in the Punjab and Baluchistan provinces remained approximately the same in the 70's (Table 3). Onion and chili pepper accounted for most of the vegetable area increase in Sind, while Irish potato and other vegetables were mainly responsible for the increase in NWFP.

Vegetable yields per ha in the NWFP are generally 35-75% lower than in the United States (Table 4). For example, potato, tomato, muskmelon and onion yields in the NWFP were 67, 47, 37 and 65% lower than U.S. yields in 1978-1979. Yield data for watermelon (Table 4) is questionable since the reported yields are approximately 3.5 times greater than average watermelon yields in the United States. Some reported crop yields -- namely cauliflower, okra, turnip and spinach, are similar or even higher than those commonly obtained in the United States.

Marketing fresh and processed vegetables. Although the major treatise of this topic is being discussed by Mr. Charles Peters, brief comments are submitted herein as they relate to production and handling of vegetable crops. First and foremost, a marketing system has developed over many years in Pakistan that tends to reduce profits by the growers. Because credit is not easily available, the average grower has traditionally relied on middlemen to supply partial credit and a market for his produce. Apparently these middlemen are organized, while the growers are not. The end result is large profits for the middlemen and modest profits for the grower. Some form of cooperatives or facilitating organizations are needed to provide credit, help purchase and monitor production inputs (fertilizers, pesticides, etc.), and establish a direct-marketing system. Yields and quality of most vegetables would increase if effective grower cooperatives were utilized in rural Pakistan. The vast knowledge and experience gained by the middlemen over the decades should somehow be included in the cooperative system. In this way, the growers could receive a more equitable share of the profits and the

middlemen could carry out the essential transportation and distribution aspects of the system.

Second, although fresh vegetables for local markets will and should be the major focus in Pakistan, processed vegetable products and fresh produce grown specifically for export should be explored. These will be discussed more fully in Section III.

III. ANALYSIS OF PRODUCTION CONSTRAINTS AND PROBLEMS

Quality of vegetable seed. Good quality (viable, vigorous and free of disease) is an absolute prerequisite for any crop. Perhaps more than any other production input, poor quality seeds account for substandard yields of vegetables in Pakistan. In 1980-81, 500 MT of vegetable seeds were imported totaling Rs 8,789,000 (35). This imported seed is approximately 25% of the amount required (5, Vol. 15). The remaining seed requirement was met by locally produced, uncertified seed which is often of low viability and vigor. Also, seed germination standards are not enforced and imported seeds not sold the first year are mixed with newly imported seed the second year, thus reducing the advantages of imported seeds

The situation with potato seed is equally bad or even worse than that for vegetables. In 1980-81, less than 5% of the potato seed planted was imported. The average potato yields in Pakistan are one third that of developed countries. Without doubt, inferior virus-infected seed is a major cause of substandard potato yields in Pakistan. Good quality potato seed can be produced in the high elevations of the NWFP. Paradoxically, however, the growers in the mountainous areas are poor and usually use infected seed from the autumn production in the plains (Punjab). These farmers have not traditionally utilized imported certified seed because of "economic reasons" and do not save their own locally-produced seed from year to year. This vicious cycle of potato seed utilization must be changed if Pakistan is to raise potato yields. Indeed, the NWFP holds the geographic key to resolving the problem of seed production for all Pakistan.

Inferior varieties. Pakistan in general and the NWFP specifically are blessed with a wide assortment of climates and soils. Most vegetable varieties are not suited for all markets, climates, and soils; thus there should be a wide choice of varieties for each crop to accommodate these different situations. Unfortunately, this is not the case in Pakistan; only a few and frequently only 1 or 2 varieties are available. This is in stark contrast with developed countries and many developing nations such as China (36) where there are many available varieties for most crops.

Most vegetable species are cross pollinated in nature and deteriorate very rapidly if proper selection and isolation are not rigidly maintained during seed production. Since most growers either save their own seed or purchase uncertified, improperly grown seed, most varieties with time lose their true identity and frequently result in inferior yields and inconsistent quality. There is also a great need for introducing early-, mid-, and late-season varieties of many species. This is particularly true for peas. When a crop such as peas has only one standard variety available, harvest is not spread out during the season and market gluts occur.

Finally, and of great potential importance, usually specific varieties are required for processing and/or export. A processing and/or export market cannot rely on excess fresh-market production to supply needed produce. On the contrary, often a separate set of varietal and cultural needs are required to satisfy these markets. Local consumers and importing countries demand a regular supply of high-quality product if sales are to be maintained or increased. Multiple market outlets increase total demand and provide greater flexibility for the grower.

Inadequate inputs and cultural methods. It should be emphasized that in this section the term "inadequate" does not imply converting to large-scale commercial production systems used in developed countries. Rather it refers to the need to improve yield and quality of vegetables utilizing inputs and methods readily adaptable by the growers. An effective system for technology transfer is not well established in the NWFP and adaptive research is needed to identify more appropriate technologies for vegetable production. Planting dates, spacing, and plant arrangements may vary with each variety and intended market. Since water is readily available in many vegetable areas of the NWFP, it appears that some growers over irrigate. Research and technology transfer is urgently needed to maximize efficient water use and avoid salinity and water logging that have occurred in Sind and Punjab.

Relatively low amounts of inorganic fertilizer are used in the NWFP. No specific data are available for vegetable growers, but only 78 Kg N and 18 Kg P₂O₅ were used per farm in the NWFP in 1979-80 (27).

These are undoubtedly inadequate amounts for high vegetable yields on the light textured soils in the NWFP. Cost of inorganic fertilizers is relatively high and credit is not readily available. In addition, at times fertilizers are not available in sufficient quantities and when needed. These and other associated problems have tended to discourage the use of fertilizers. Many growers apply animal manures and rotate with leguminous fodder crops; however it is believed that N and P are limiting factors in most instances.

Inadequate plant protection is a serious problem with vegetable production in the NWFP. Many growers do not have spraying equipment and/or have not been trained in the technology of chemical pest control. For a time recently the extension agents assisted the farmers with spraying in some areas but this program is being discontinued because of inadequate personnel and funding.

Fruit fly and red pumpkin beetles on cucurbits, aphids and cutworms in potatoes, cabbage worms in cole crops, and borers (stem and fruit) in solanaceous fruits are the major insect pests. Powdery mildew and early blight are the two most serious fungal diseases; while leaf roll is the major virus problem with potatoes. There is a real need to introduce varieties resistant to specific diseases and insects.

Inexpensive, small-farm equipment is needed in the NWFP. Since most growers use antiquated equipment drawn by oxen or water buffalo, more effective plows and harrows would improve land preparation. Improved certified seeds are expensive for small farmers. Thus, inexpensive hand or power-drawn vegetable seeders would reduce seed costs by reducing seeding rates per ha. Currently, many NWFP growers broadcast and thin following germination. Precision seeding would encourage purchasing improved seeds since the rates required would be less. As previously mentioned, small spraying equipment is urgently needed throughout the NWFP.

Credit. Vegetables are highly intensive crops and initial investment is very high compared to most agronomic crops. In some cases cold storage and delayed marketing are very beneficial in improving net economic return. Thus, credit is needed but unfortunately few growers utilize credit through the low-interest Federal Cooperative Bank system now available. In most instances, middlemen provide credit services for growers; however, in so doing, they are bound to sell to the middlemen and often at a very low price.

IV. RECOMMENDATIONS FOR FUTURE DEVELOPMENT

Seed production. During World War II, large quantities of vegetable seeds were produced in the Baluchistan Province for domestic use and export (personal communication from Dr. Zahur Alam). This province and many other selected sites in the NWFP are gifted with climatic conditions for growing vegetable seeds. The high elevations of the NWFP

appear to have great potential for producing high quality potato seed. A scheme for producing potato seed has been developed by Dr. Zahur Alam of the PARC (34). This plan should be thoroughly studied, improved where appropriate, and put into practice. With the proper foreign assistance and cooperation (personnel and funds) from the PARC, Pakistan could be self sufficient in potato seed in six years.

A plan for improving and producing vegetable seeds is underway at the Tarnab Agricultural Research Institute and the sub-stations in the NWFP. This is encouraging but additional efforts are needed to improve this program. It is highly recommended that a qualified, private-sector component be involved early on in the vegetable seed project. One possible way to expedite this project would be to invite a reputable seed company to develop a seed improvement and production program in Pakistan. Perhaps financial and personnel assistance could be supplemented by PARC and hopefully other sources. The potential for seed export should be explored to encourage investment by reputable seed companies. Enforcement and, if necessary, improvement of seed purity and germination laws are obviously requirements for a seed industry to be developed in Pakistan.

Varietal improvement and diversification. For the majority of crops, a wide assortment of improved varieties should be made available to growers. Well organized varietal trials should be conducted at each Agricultural Research Institute where vegetables are grown. Demonstration plantings of the best varieties should be strategically placed on the farms of local growers who have the most influence in the community. Results of these demonstration trials and seed samples should be made available through agriculture field days and other extension methods. A small charge for seed samples will enhance the value of the new varieties in the eyes of the growers and will discourage waste -- something free is not worth having. A breeding and selection

program for improved varieties of some crops should be developed as expertise is gained in coordination with the seed production program.

In general open-pollinated varieties should be sought for introduction into the NWFP; however superior hybrids have been developed for many crops and should be tested, especially if the hybrids show high levels of pest resistance not available in open-pollinated types.

Production practices. Obviously a detailed account of recommended production practices is not the objective of the report. Production methods must be tailored to the needs and strengths of each crop and area. However, some possible research topics for exploration are given below based on my observations, library search, and interviews with knowledgeable local people.

- (1) Water management. A thorough assessment should be made of the existing irrigation practices of vegetable growers and steps (research and extension) be taken to maximize water use efficiency and avoid potential salinity and water-logging problems.
- (2) Soil fertility. The quantity of available nutrients, especially N and P, is probably inadequate throughout the season to sustain maximum yields. Growers should be educated regarding the proper use, placement, and timing of both organic and inorganic fertilizers. From the outset, it is assumed that many growers cannot afford to purchase recommended amounts of inorganic fertilizers. Thus, composting of available refuse, using green-manure crops where possible, and crop rotations with leguminous crops should be promoted. These practices in combination with correct placement and timing of small amounts of readily available inorganic fertilizer could increase yields significantly in the NWFP. In this connection, judicious use of

irrigation water will reduce leaching of N.

Small amounts of fertilizer, especially phosphorus, should be used to produce vigorous, sturdy plants for field setting. Nutrient status of plant-growing beds should be assessed since vigorous young plants lay the foundation for future yield and cost of fertilizer for plant beds is minimal.

(3) Pest protection. Insects and diseases undoubtedly account for large reductions in crop yields. Pest management is needed not pest control. The Chinese have done a remarkable job of pest management utilizing different combinations of chemical, cultural, biological, and organic methods (36). These methods should be explored rather than attempting to push expensive chemicals for pest control to farmers who cannot afford them and cannot read pesticide labels. Environmental and health impacts must be considered as well since at present farm laborers routinely spray without wearing shoes. Chemical weed control is probably not advisable at this stage of agriculture development for most vegetable growers in the NWFP.

(4) Tillage and other cultural practices. Planting dates, spacing, and plant arrangement should be determined in connection with introduction of improved varieties and fertilizer practices. Tillage methods and use of raised beds for drainage would be research topics associated with new land preparation equipment and precision seeding.

Harvesting, handling and grading. Harvesting beyond the maximum quality stages appears to be a problem with some crops such as peas and carrots. Growers should be taught the proper stage of maturity for harvesting to obtain maximum quality, especially for processing and export markets. For local fresh-market situations, the present system of handling appears to be adequate. There is little grading done; thus price differences according to quality are rare. For example, the price tended to be the same each day of our visit although the quality might vary from day to day. Substantiation and improvement of this grading/pricing system should be explored. The implications for export are obvious.

Storage and marketing. Because of the price of sugar and imported tin plate, the vegetable canning industry does not appear to have a bright future in Pakistan except for specialized (military and the rich) in-country consumption. In 1980-81, 16 MT of dehydrated vegetables were exported (35). For the past 10 years, however, the amount of dehydrated vegetables exported has varied considerably ranging from zero to 34.2 MT (7). From 1975 to 1980, foreign export of fresh potatoes, onions, garlic and chili peppers steadily increased to nearly 125,000 MT (7,35). The problem is the same as for dehydrated vegetables -- the proportion each year of these four commodities varies considerably. The obvious conclusion of these data are twofold. First, there is a potential for export of selected vegetable crops from Pakistan, but the full potential should be explored and particularly for the NWFP. Second, a separate export industry should be developed apart from the main stream of fresh market production for local consumption. The proposed Fruit/Vegetable Development Board (FVDB) should play a large role in increasing vegetable exports from the NWFP. In addition, movement of fresh vegetables into other provinces within Pakistan could be increased. The FVDB should play an integral part in this endeavor as well.

As alluded above, the major factor determining price appears to be quantity not quality. Although cold storage is available at a reasonable price, most growers do not use these facilities because of cash-flow problems. Here again, the FVDB could intercede in facilitating the use of cold storage facilities. The NWFP has the potential for supplying seed potatoes for all of Pakistan. Additional cold storage facilities in the NWFP would eventually be necessary if the seed were stored before transporting to the other provinces.

Credit. The FVDB could improve earnings for the growers by assisting and promoting the correct use of credit through the established Federal Cooperative Bank system. Increased use of credit should result in increased purchase of production inputs such as improved varieties and fertilizer.

Comments on development of selected individual crops.

Only brief comments are presented on the most important vegetable crops since it is impossible in three weeks time to obtain a full grasp of the problems.

- (1) Irish potato. Irish potato is the second major vegetable crop grown in the NWFP (Table 4). It grows well and has great potential for food consumption and for seed. Major seed production problems are mosaic and leaf-roll viruses, which are not a problem at high elevations. Yields are low because infected seed is used and there is heavy incidence of early blight. Apical dominance is a problem because the potatoes used for seed are only stored 3-4 months before planting. Research should be initiated to break apical dominance using proper storage and chemical methods. Incorporation of correct production practices could increase yields by 2 to 3 times. Resistance to early blight should be sought. The major potato seed industry should be developed in the NWFP.

- (2) Tomato. The NWFP is one of the only provinces where tomatoes can be grown throughout most of the year. High temperatures in Sind and Punjab limit fruit set during May - August. From August through February, the NWFP supplies most of the tomatoes in Pakistan. Acreage is increasing and could increase considerably more under proper guidance of the FVDB. Export potential of tomatoes should be explored. Major problems, other than fruit set, are early blight and mosaic virus. The major variety grown is 'Roma'. New introductions should be tested, especially those having tolerance to early blight.
- (3) Muskmelon and watermelon. In 1980-81, 30,880 MT of melons (Garma and Sarda) were imported from Afghanistan. These special melons are very large and sweet and require a dry-cool climate to grow properly. Areas should be sought in Baluchistan and NWFP to grow these melons. Muskmelons grow well and are the leading crop in area planted in the NWFP (Table 4). Muskmelon seed is of local origin. 'Sugar Baby' and 'Charleston Grey' watermelons are grown but the former is preferred. Watermelon seeds are both imported and locally grown. Both muskmelons and watermelons have good potential for expansion in the NWFP. Improved varieties should be tested that have good shipping and storage qualities. Powdery mildew resistance in muskmelon is a high priority.
- (4) Carrots, radish and turnips. A local variety of carrot is produced in Pakistan that is high yielding but develops a very woody core. New varieties should be tested that have superior quality and that can grow well in hot weather. 'Purple Top' turnip grows well and has potential for expansion for movement into Sind and Punjab during hot summer months. Both red and white radishes are grown in the NWFP and expansion should be easy for sales to the other provinces.

- (5) Peas. Garden and field peas grow well in the NWFP but powdery mildew devastates the crop after mid-spring. Indeterminate early-, mid-, and late-season varieties should be evaluated to extend the harvest season. There is a good market for fresh-market peas. This crop should be promoted in the NWFP where cool growing conditions exist longer than the other provinces in Pakistan.
- (6) Okra. Okra is an important early-summer crop in the NWFP. Testing should be conducted to find late-season varieties that have resistance to leaf blights.
- (7) Onions and garlic. Area planted in onion and garlic is increasing in the NWFP. Yields are relatively low, but improved seed quality and cultural practices should enhance yields considerably. Local varieties do well; however, because of the excellent established markets, varietal screening for disease resistance and research on associated cultural practices should be conducted.
- (8) Cabbage and cauliflower. Of all the provinces the NWFP is best suited for extended production of cole crops. Cabbage seed is imported, but seed production is feasible in the high elevations of the NWFP where cool temperatures would provide sufficient chilling for good seed production. Indeed, seed production of cabbage as well as the other biennial crops (cauliflower, turnip, carrot, etc.) should be promoted through the FVDB.

V. OBJECTIVES OF VEGETABLE DEVELOPMENT PROJECT
(TO BE ACCOMPLISHED IN A SIX YEAR PERIOD)

Research.

- (1) Establish a certified potato seed program that will enable Pakistan to be self sufficient in potato seed production.
- (2) Develop a certified vegetable seed industry that will produce at least 75% of the needs of the country.
- (3) Increase yields by a minimum of 50% in selected target areas of the NWFP
- (4) Increase provincial and foreign vegetable exports by 100%.

Extension.

- (1) Organize and coordinate extension with research. This must be in the field and in practice not just on paper.
- (2) Increase the number of extension specialists that are specifically trained in different aspects of vegetable production.
- (3) Assist at least 50% of the commercial vegetable growers in the NWFP to improve yields, quality, and marketing of their vegetables. Perhaps an extension coordinator should be employed by the FVDB to work directly with the provincial extension agents to promote production and marketing aspects of the FVDB projects.

Training.

- (1) Support and improve, where necessary, the Training and Visit (T & V) program already in existence. The research staff should train the extension personnel. In this way both research and extension benefit and this would help develop the desired coordination between them.
- (2) Develop and enforce in-service training for all extension agents. Research personnel and perhaps the agriculture faculty at Peshawar should be involved.
- (3) Improve the level of expertise and specialization of both the research and extension staff through participant-training programs at selected local and foreign universities and at international institutes such as CIP, AVRDC, AND CIAT.

There are two critical points to make regarding training. First, under the present system of salaries and promotions in Pakistan, advanced degrees (especially the Ph.D.) are "tickets" out of the system. An example is offered to illustrate this point. A key agricultural leader in Pakistan has applied for a position in another country that offers 8 times his existing salary. Because he has an advanced degree, he will eventually accept this or another similar position. Salary advances within a given position must be improved in Pakistan. Currently, major salary advances come with new positions. This system generates discontinuity in programs and individuals accepting positions for which they have little qualifications.

Second, the types of advanced training are often inappropriate for the needs of developing countries. Research and extension workers from Pakistan should be trained in applied

disciplines. Unless the present system of salaries and promotions is changed, sending people abroad for M.S. and Ph.D. degrees is too time consuming and often counter-productive. Two alternatives are suggested. (a) short courses on specialized topics in developing countries and/or International institutes. (b) the thesis or dissertation projects must be done in Pakistan for those individuals receiving M.S. and Ph.D. degrees.

VI. SCOPE OF WORK AND ISSUES FOR CONSIDERATION FOR PROJECT DESIGN TEAM -- VEGETABLE CROPS

Potato and vegetable seed production. Detailed studies should be conducted to further identify the potential for domestic and foreign purchase of certified seed and the factors that might limit seed production in the NWFP. What would be the cost savings to the grower compared to imported seed? Where are the best areas for seed production? Could a reputable seed company make a large enough profit in Pakistan to establish a subsidiary here? Would the Government of Pakistan support such an endeavor? To what extent and at what point in time should the private sector become involved?

Introducing new varieties and improving production practices.

Because there is much that can be done, care must be exercised to not recommend everything at once. The vegetable production expert of the design team should spend several weeks in the NWFP during production and harvest if possible to obtain a first-hand assessment of the varietal needs and limiting production factors. The design team should outline a project that will first thoroughly assess the issues involved and second, resolve them in a rational, stepwise procedure. Issues to be resolved during the project implementation include the following: Which crops and districts have the greatest potential for increasing yields and grower profits? Can the marketing system accommodate the increased production of a given vegetable crop? Are cold storage

23

and/or grading facilities needed? Will there be sufficient production inputs (water, fertilizer, pesticides, etc.) available and at the right time if vegetable acreage is significantly increased? Will there be any environmental impact problems?

Training necessary to meet objectives. The design team will outline a six year project that will answer the objectives of the project. The Pakistan training component is very critical for the success of the project. Improved local expertise in the following disciplines will be necessary: seed production and certification, plant breeding and varietal improvement, soil fertility and management, water management, plant protection, and marketing.

VII. TYPES OF EXPERTISE REQUIRED FOR DESIGN TEAM -- VEGETABLE CROPS.

Specialist in seed production and certification. The person should have a M.S. or Ph.D. in vegetable production with considerable hands-on experience in seed production and certification. Because this is the most important technical aspect of the project, it is recommended that he/she be sent prior to the arrival of the main design team to thoroughly analyze the problems and potentials of seed production in the NWFP. If possible, the seed specialist should overlap at least for two weeks with the vegetable crops person.

Specialist in cultural management of vegetable crops. This person should have a M.S. or Ph.D. in vegetable crops with experience in all practical aspects of vegetable production, including harvesting and marketing if possible. He/she should have expertise in adaptive research with a minimum of 2 to 3 years in international development. Experience in project design and proposal preparation would be helpful.

VIII. VEGETABLE DEVELOPMENT PROJECT -- A FIRST APPROXIMATION
OF STAFF AND PARTICIPANT TRAINING NEEDS

Long-Term Experts (LTE)

1. Vegetable crops specialist with experience in plant breeding and improvement (72 months).
2. Seed production and certification specialist in potato and vegetables (48 months).
3. Soil fertility specialist (24 months). For both fruit and vegetables.
4. Irrigation specialist (24 months). For both fruit and vegetables.
5. Vegetable extension specialist (24 months).

Short-Term Experts (STE)

1. Plant Pathologist (10 months). For both vegetables and fruits.
2. Entomologist (10 months). For both vegetables and fruits.

A suggested schedule for experts and counterpart participant trainees is presented in Table 5. Participant training should be concentrated during the first two years of the project.

IX. ACKNOWLEDGEMENTS

Gratitude is extended to my fellow team members (Charles Peters, James Ballard and Eugene 'Tony' Babb) and our typist (Mrs. Bette Minehart) for their friendship and cooperation. I wish to thank Dr. Ronald Curtis, Dr. Ray Carpenter and the many other USAID and Pakistan officials for their hospitality and assistance. Finally, special appreciation is given to Mr. Mohammed Sulyman, Consultant INM, for his endless enthusiasm, sense of humor, and knowledge of vegetable production in Pakistan -- all of which helped make my visit to Pakistan both pleasant and rewarding.

TABLE 1. IRRIGATED AND UNIRRIGATED AREA OF MAJOR SUMMER AND WINTER VEGETABLES IN THE NWFP, 1979-1980 (27)

CROP	SUMMER			WINTER		
	Irri- gated	Unirri- gated	Total	Irri- gated	Unirri- gated	Total
Potato	-----	--	-----	7,200	1,200	8,400
Onion	-----	--	-----	2,600	-----	2,600
Other vegetables	16,100	00	16,100	6,000	-----	6,000
TOTAL	16,100	--	16,100	15,800	1,200	17,000
Chickpea	-----	00	-----	6,800	108,000	114,800
Other pulses	NA	NA	19,200	NA	NA	4,400
TOTAL	—	—	19,200	--	--	119,200

TABLE 2. IDENTIFICATION OF VEGETABLES GROWN IN NWFP

COMMON NAME		
ENGLISH	PUSHTO	SCIENTIFIC NAME
<u>Cucurbits:</u>		
Muskmelon	Kharbuza	Cucumis melo, Reticulatus Group
Watermelon	Hundwana	Citrullus lanatus
Summer squash	Ghiya Kaddu	Cucurbita pepo
Summer squash	Tinda	Cucurbita pepo
Bitter gourd	Karaila	Cucurbita pepo
Pumpkin	Halwa Kaddu	Cucurbita pepo
Cucumber	Kheer	Cucumis sativus
<u>Solanaceous Fruit:</u>		
Tomato	Tomatar	Lycopersicon esculentum
Eggplant	Baigun	Solanum melongena
Pepper, Chili	Merch	Capsicum annum, Longum Group
Pepper, Bell	Kashmir Merch	Capsicum annum, Grossum Group
<u>Roots, Tubers, and Bulbs:</u>		
Potato	Alu	Solanum tuberosum
Sweet potato	Shakerkaudi	Ipomoea batatas
Taro	Kachalu	Colocasia esculenta
Carrot	Gajer	Daucus carota var. sativus
Turnip	Shalghum	Brassica rapa, Rapifera Group
Radish	Mooli	Raphanus sativus
Beet	Chakauder	Beta vulgaris
Onion	Piaz	Allium cepa
Garlic	Thoom	Allium sativum
<u>Legume and Other Crops:</u>		
Garden pea	Mudder	Pisum sativum
Broad bean	Baudley	Vicia faba
Kidney bean	Lobia	Phaseolus vulgaris
Okra	Bhindi	Abelmoschus esculentus
<u>Greens, Salad and Cole Crops:</u>		
Spinach	Palak	Spinacia oleracea
Mustard	Raya	Brassica juncea
Lettuce	Salad	Lactuca sativa
Cabbage	Bundgobi	Brassica oleracea, Capitata Group
Cauliflower	Phoolgobi	Brassica oleracea, Botrytis Group
Chinese cabbage	Chinese gobi	Brassica rapa, Pekinensis Group

TABLE 3. AREA AND YIELD BY PROVINCE OF THE MAJOR VEGETABLES GROWN IN PAKISTAN, 1971-1975 and 1976-1980 AVERAGES (10)

CROP	PUNJAB	SIND	NWFP	BALUCH- ISTAN	PAKISTA
Onion - Area (ha)					
1971-1975	9,400.	9,800	2,300	2,100	23,600
1976-1980	10,000	19,200	2,500	3,000	34,700
Onion - Yield (MT/ha)					
1971-1975	11.9	7.9	11.6	13.9	10.4
1976-1980	12.2	8.6	12.2	14.0	10.4
Garlic - Area (ha)					
1971-1975	900	300	800	-----	2,000
1976-1980	1,000	1,300	1,200	100	3,600
Garlic - Yield (MT/ha)					
1971-1975	11.4	7.5	12.5	-----	11.3
1976-1980	11.4	6.5	7.2	4.0	8.0
Chili Pepper - Area (ha)					
1971-1975	17,000	13,900	1,300	1,000	33,900
1976-1980	23,200	31,000	1,000	900	56,100
Chili Pepper - Yield (MT/ha)					
1971-1975	1.5	1.6	0.9	1.3	1.5
1976-1980	1.5	1.8	1.0	1.2	1.6
Potato - Area (ha)					
1971-1975	14,000	1,200	5,700	2,600	23,500
1976-1980	21,400	1,100	7,600	2,900	33,000
Potato - Yield (MT/ha)					
1971-1975	11.3	8.6	10.1	9.4	10.7
1976-1980	12.0	8.5	9.2	9.1	10.8
Other * Vegetables - Area (ha)					
1971-1975	84,100	20,100	15,300	6,400	125,900
1976-1980	67,800	24,300	21,100	6,500	119,700
TOTAL AREA (ha)					
1971-1975	126,100	45,300	25,400	12,100	208,900
1976-1980	123,400	76,900	33,400	13,400	247,100

* Refer to Tables 2 and 4 for a listing of the other vegetables.

TABLE 4.

AREA AND YIELD OF VEGETABLES GROWN IN THE NWFP,
1974-75 and 1978-79

	1974-75		1978-79		Approximate Avg. yield in the U.S. (MT/ha)
	Area (ha)	Yield (MT/ha)	Area (ha)	Yield (MT/ha)	
<u>SUMMER</u>					
Watermelon	1,388	49.2	1,634	44.5	12.9
Muskmelon	11,437	8.6	8,916	10.0	15.7
Okra	580	8.7	658	9.7	7.8
Summer squash (Tinda)	145	8.8	292	10.6	22.4
Eggplant	327	12.1	530	13.5	22.4
Bitter gourd	59	8.2	174	11.4	NA
Summer squash (Ghiya Kaddu)	140	12.1	139	11.9	22.4
Pumpkin	61	12.9	139	12.4	33.6
Tomato	1,497	7.3	1,781	10.0	19.0
Cucumber	-----	-----	-----	-----	12.3
Taro	455	10.3	466	9.8	NA
Chili Pepper	1,000	1.0	700	1.0	4.5
Other	2,484	9.1	965	6.8	-----
TOTAL - Summer	19,573	-----	16,394	-----	-----
<u>WINTER</u>					
Turnip	908	18.3	1,102	17.8	22.4
Carrot	239	16.7	264	18.9	31.3
Spinach	371	14.5	641	13.7	7.8
Tomato	1,048	8.4	1,811	10.5	19.0
Cauliflower	471	17.2	710	13.9	11.1
Cabbage	272	13.4	95	13.3	23.5
Sweet potato	10	5.1	-----	-----	12.9
Peas	197	7.2	139	5.7	4.5
Radish	289	13.4	419	12.8	NA
Lettuce	2	16.0	-----	-----	25.8
Potato	7,946	8.9	8,220	9.3	28.0
Onion	2,400	12.2	2,100	12.3	34.7
Garlic	900	14.4	1,400	7.6	14.6
Other	337	10.6	792	14.4	-----
TOTAL - Winter	15,390	-----	17,693	-----	-----
GRAND TOTAL	34,963	-----	34,087	-----	-----

TABLE 5. SUGGESTED SCHEDULE FOR EXPERTS AND TRAINEES FOR PROPOSED VEGETABLE PROJECT

EXPERT	YEAR (PERSON MONTHS)					
	1	2	3	4	5	6
Vegetable crops	12	12	12	12	12	12
Seed production	12	12	12	12		
Soil Fertility		12	12			
Irrigation		12	12			
Extension			12	12		
Plant pathology	4	2	2		2	
Entomology	4	2	2		2	
TOTAL	32	52	64	36	16	12
<u>PARTICIPANT TRAINEE</u>						
Vegetable crops (2)		12	12		12	12
Seed production (2)	12	12	12	12		
Soil fertility		12				
Irrigation	12					
Extension	12	12				
Plant pathology	12					
Entomology	12					
TOTAL	60	48	24	12	12	12

PAKISTAN TREE FRUIT REPORT

JIM BALLARD

20-4-82

Description of Current Situation N.W.F.P.Soils and Topography

Reports verify the visual observation of excellent deep silt or sandy loams laid down in alluvial plains. These soils are, in most cases, stabilized with terraces to aid irrigation and thus minimize the erosion factor. Drainage is no problem, as observed by consultant Ballard, however, the application of water appears to be excessive in relation to proper rates and frequency.

Climate

Here again both the statistical reports and the observation of crops grown confirm a near ideal climate for the production of citrus, apples, Asian pears, persimmon, plums, apricots, peaches, guava, loquat, walnuts, grapes, and berries (brambles).

Population

Ballard's candid opinion sees a parallel of population growth with Mexico where no shortage of agricultural labor is anticipated into the foreseeable future. The Pakistani growth rate of 3% is alarming when one considers the needs for the expanding population and the country's available resources.

Size of Farms

With regard to tree fruit production, the small size of orchards or fruit blocks precludes the use of western fruit production techniques of mechanization. This is not to say that Pakistanis should expect to adapt to western type mechanization. Fruit blocks are intercropped with vegetables or forage crops and this, with the wide

spacings of trees makes it difficult to comprehend the actual number of fruit trees. A visit to one farmer with seven sons on his 15 acre farm made one wonder how the future management or division of that farm would be handled. His home and standard of living appeared to be above average. Most fruit farms are less than two hectares in size.

Infrastructure

Roads

By Mexican standards the highway system is excellent with fair to good farm-to-market routes. By U.S. standards, the roads are inadequate due to the crowding of the various types of carts, cars, trucks and buses (especially in the cities). A better road system is slowly being made but delayed transportation will remain throughout the foreseeable future. Refrigerated railroad cars are available between the principal cities. However, in the Swat district no railway exists due to the very rugged mountain passes. Export of fruit out of Swat has to be hauled over the steep winding mountain roads.

Market Facilities

The team visited the Peshawar retail and wholesale food markets. The traditional methods of preparing, transporting (farm to market), and selling the produce gives the impression of unorganized confusion lending to much loss due to spoilage, rough handling and lack of refrigeration. The unorganized marketing structure is, to the American visitor, emphasized with the lack of quality standards, grade requirements and sanitary facilities. This system is of benefit only to the middle man and tends to leave the farmer in no position to be an influence for upgrading his income.

Major Irrigation Systems

Gravity flow systems (many established in early colonial era) appear to be adequately designed to meet the needs of agriculture. The team saw evidence of continual upkeep and improvement. There is no sprinkling or trickle irrigation in NWFP nor would one expect to see any interest in it with the apparent success of the existing gravity flow systems. In all other major tree fruit production areas of the world, the irrigation trend has been from flood or furrow gravity flow to piped systems of sprinkling or trickle.

Following Ballard's seminar at the Mingora Agricultural Research Institute in Swat, the local Director of Extension asked a question that indicated he had misinterpreted Ballard's reference to sprinkling irrigation as the main reason for the high yields of U.S. apple production. Ballard surprised him with the fact that these high yields were also achieved with furrow irrigation prior to the change over to sprinkling systems.

Agricultural Systems

Research and Extension

Visits into the Peshawar and Swat districts revealed that Extension is not establishing the traditional demonstration orchards or orchard trials common in the U.S. An early attempt in the late seventies to demonstrate proper codling moth control created the impression that the Extension Service was in the spray business with full government financial support. The results were inadequate and misleading. Now the growers must spray their own crops. Most use backpack sprayers. Some standard tractor pulled orchard sprayers are utilized by the larger growers. Extension has not gotten the message across to growers on the importance of pruning and spraying as the principal means to increase profitable yields. We visited one Extension office near Peshawar which had posters and bulletins available in their educational program. These.

alone, are of negligible value if not accompanied by convincing demonstration plots.

Major Crops Produced

The Research Station at Tarnab which was established 10 miles east of Peshawar in 1910, revealed very intensive research trials on grain and vegetables, and less intensive trials on tree fruits. The variety evaluation trials included peaches, plums, apples, citrus, apricots, persimmon and guava. Apple is not an important crop in the Peshawar basin because the climate does not satisfy its winter chilling requirement.

At the Mingora Agricultural Research Institute in the Swat we saw a newly developing station with a very enthusiastic superintendent, Mr. Abdul Qadim Syed, and an equally enthusiastic horticulturist, Faridullah K. Wazir, who have launched some extensive projects. The fruit and nut variety trials included these varieties:

APPLES

- | | |
|----------------------|--------------------------|
| 1. Vista Bella | 18. Fasse Pamac |
| 2. Kapai-Red | 19. Sharp Democrat |
| 3. Yellow Delicious | 20. Russel Red |
| 4. Spartan | 21. Sky-spur |
| 5. Lady William | 22. Wayns spur |
| 6. Red Delicious | 23. Starking Delicious |
| 7. Starking Red | 24. Legana |
| 8. Valore | 25. Red King Delicious |
| 9. Eaton Croffan | 26. Double Red Delicious |
| 10. Ohio Red Rome | 27. Rome Beauty |
| 11. Passe Paco | 28. Granny Smith |
| 12. Tropical Beauty | 29. Yates |
| 13. Mutsu | 30. Macintosh |
| 14. Early Strawberry | 31. Mollies Delicious |
| 15. Abus | 32. Red Gravenstein |
| 16. Nugget | 33. Bonser |
| 17. NJ59 | |

The apple varieties Ballard suggested to be added to this list were:

- | | |
|-------------------------------------|---------------|
| 1. Jersey Mac | 11. Jonagold |
| 2. Tydeman's Red | 12. Regent |
| 3. Paulared | 13. Lysgolden |
| 4. Prima (Scab immune) | 14. Idared |
| 5. Jonamac | 15. Criterion |
| 6. Macoun
(in cooler late areas) | 16. Hawaii |
| 7. Liberty | 17. Ruby |
| 8. Redcort Cortland | 18. Burgundy |
| 9. Empire | 19. July Red |
| 10. Smoothee | 20. NJ46 |

Apricot varieties established at the Agricultural Research Institute at Mingora include:

- | | |
|-------------------|---------------|
| 1. Mahmudi | 9. Red French |
| 2. Blenheim | 10. Morocco |
| 3. Travett | 11. Speena |
| 4. New Jersey A | 12. Kesi |
| 5. Abdullah Khani | 13. Kabali |
| 6. Shakar-para | 14. Suffeda |
| 7. Nari - 1 | 15. Gold Cot |
| 8. Charmaghz | 16. Boi |
| | 17. Moorpark |

Ballard suggested the addition of Goldrich, Rival, Sungold and Earligold. Washington State University (Prosser) has an early frost-hardy selection not yet named.

Plum varieties on trial at the Mingora Agricultural
Research Institute include:

1. Beauty
2. Creech Selection No. 1
3. Creech Selection No. 2
4. Crimson
5. Early Methly
6. Eggu
7. Fazal Manani
8. Freestone
9. Frontier
10. Labhu
11. Narabeen
12. Robusto
13. Shirley
14. Swat Sdlg. 1
15. " " 3
16. " " 4
17. " " 7
18. Satsuma

Ballard suggests they obtain the following varieties for test:
Methley (very early), Red Heart, Elephant Heart, Empress
and President.

Peach trials under test at the Mingora Agricultural Research Institute has a very impressive list of over 90 varieties including some of the newest and finest Freestone peaches known. Such a lengthy list surprised consultant Ballard because statistics and grower interviews showed less interest in growing peaches because of the Med-fly.

Established varieties include:

1. Australia Producer
2. Babcock
3. B-1664
4. Bell of Georgia
5. Bicentennial
6. Bluzzing Gold
7. BU 4 - 375
8. Camden
9. Carmon
10. Carelein
11. Corola
12. Coronet
13. Crest Haven
14. Creech 3
15. Creech 4
16. Creech 5
17. Creech 6
18. Desired
19. Durbin
20. Elberta
21. Eldorado
22. Earl-Grabde
23. Explorer
24. Fair Haven
25. Fair Time
26. Glohaven
27. Golden Dust
28. Germa
29. Halford
30. Harvester
31. Indian Blood
32. Jamer Late Elberta
33. J. H. Hale
34. June Gold
35. Karla Rose
36. Keystone
37. L-71-A-7330
38. L-71-A-7334
39. Loring
40. Lalarukh
41. Lafelicianana
42. Madison
43. Majestic
44. Niland
45. New Jersey C-90
46. New Jersey 1-62
47. New Jersey 2-31
48. New Jersey 2-39
49. New Jersey 2-41
50. New Jersey 2-51
51. Penman
52. Puller
53. Runger
54. Red Skin
55. Rich Haven
56. Rio Oso Gem
57. Robin
58. Rosa
59. Salway
60. Sentinal

Peach varieties (continued):

- | | |
|------------------|--------------------|
| 61. Spring Crest | 75. Texas 46-24-68 |
| 62. Spring Dust | 76. " Y-5-52 |
| 63. Stanery | 77. " X-9 |
| 64. Starlite | 78. " Y-7-72 |
| 65. Summer Gold | 79. Topaz |
| 66. Summer Set | 80. Tyler Queen |
| 67. Sunbrite | 81. Velvet |
| 68. Suzie-Q | 82. Wade |
| 69. Texas Y-5-62 | 83. Wiggen |
| 70. " 2-718-69 | 84. Wimble |
| 71. " Y-6-51 | 85. Yunco Queen |
| 72. " A-6-69 | 86. 6-A |
| 73. " Y-4-55 | 87. 3-A |
| 74. " M-9 | |

Nectarine varieties established at the Mingora Agricultural Research Institute include:

- | | |
|------------------|------------------|
| 1. Early King | 7. New Jersey 62 |
| 2. Fantasia | 8. New Jersey 82 |
| 3. Flavortop | 9. Red Gold |
| 4. Freedom | 10. Red Chief |
| 5. Goldmine | 11. Stanwick |
| 6. New Jersey 61 | 12. Sungold |

Consultant Ballard did not suggest additional varieties of peaches or nectarines because all the outstanding ones are already included as of 1982.

NUTS

Almonds on trial at the Mingora Agricultural Research Institute include:

1. Gordonola
2. Neplus-ultra
3. Nonparial
4. Mission
5. Vesta

The University of California at Davis has new varieties under test which may be available to Pakistan research.

Walnuts under test at the Mingora Agricultural Research Institute include:

- | | |
|---------------|--------------|
| 1. Corne | 8. Mohan |
| 2. Franquette | 9. Pariseme |
| 3. Gustine | 10. Payne |
| 4. Grand-gean | 11. Sorrento |
| 5. Lompoc | 12. Stout |
| 6. Mayette | 13. Thema |
| 7. Midland | 14. Vina |

The average run of walnut and pecan seedlings of the better varieties will produce very good progeny. Consultant Ballard suggests the inclusion of the better pecan clones to be added to the research plots and use those nuts for a seed source.

PERSIMMONS

Persimmons are grown in the NWFP with some interest in variety trials at Mingora. These include Shens, Nowles, Saruga and Saijo. The evaluation of persimmons in the U.S. is one of the major interests of the North American Fruit Explorers Association. There are several new superior varieties which would be available to Pakistan through this association.

Tree fruit production statistics are given here for the five year averages of 1970/75 and 1975/80. [Source: 10.] Expressed as tonnes '000'/hectares '000' (a) Negligible or not available.

CITRUS

<u>PERIOD</u>	<u>PUNJAB</u>	<u>SIND</u>	<u>NWFP</u>	<u>BALUCHISTAN</u>	<u>TOTAL</u>
1970-75	482.3/42.9	25.1/1.8	18.7/2.4	0.9/0.2	527.0/47.3
1975-80	668.2/69.6	30.9/2.7	22.5/2.7	1.0/0.3	722.6/75.3

MANGO

1970-75	340.6/25.5	215.1/31.2	0.5/0.1	2.2/0.4	558.4/57.2
1975-80	305.5/24.2	255.0/33.2	1.2/0.1	3.2/0.5	564.9/58.0

1970-75	2.8/0.6	87.7/9.8	9.7/0.5	0.3/(a)	100.5/10.9
1975-80	6.6/1.3	109.7/12.3	7.5/0.4	0.6/0.1	124.4/14.7

APPLE

1970-75	2.0/0.4	0.3/0.1	14.0/1.2	26.1/3.7	42.4/5.4
1975-80	3.1/0.5	0.2/0.1	39.7/3.4	41.4/5.5	84.4/9.5

GUAVA

1970-75	69.0/10.3	18.3/3.2	11.5/1.3	0.8/0.2	99.6/15.0
1975-80	86.7/12.7	19.5/2.4	13.0/1.5	1.1/0.2	120.3/16.8

APRICOT

1970-75	(a)/(a)	(a)/(a)	5.8/0.6	13.4/1.5	19.3/2.1
1975-80	0.3/0.1	(a)/(a)	6.2/0.6	23.3/2.1	29.8/2.8

PEACH

1970-75	1.3/0.2	(a)/(a)	2.1/0.3	5.4/0.5	8.8/1.1
1975-80	1.5/0.3	(a)/(a)	1.6/0.2	6.8/0.7	9.9/1.2

PEARS

<u>PERIOD</u>	<u>PUNJAB</u>	<u>SIND</u>	<u>NWFP</u>	<u>BALUCHISTAN</u>	<u>TOTAL</u>
1970-75	6.7/1.1	(a)/(a)	14.7/1.0	0.8/0.1	22.3/2.2
1975-80	8.1/1.2	(a)/(a)	22.5/1.8	0.8/0.1	31.3/3.1

PLUMS

1970-75	0.1/(a)	(a)/(a)	21.3/1.4	6.3/0.6	27.7/2.0
1975-80	0.1/(a)	(a)/(a)	21.3/1.8	9.0/0.7	30.4/2.5

GRAPES

1970-75	(a)/(a)	(a)/(a)	0.6/0.1	25.0/2.3	25.6/2.4
1975-80	(a)/(a)	(a)/(a)	0.2/0.1	28.5/2.4	28.0/2.5

POMEGRANATES

1970-75	4.1/0.8	0.2/0.1	0.5/(a)	20.9/1.1	25.7/2.0
1975-80	5.5/0.9	(a)/(a)	0.5/0.1	22.1/1.1	28.1/2.1

DATES

1970-75	33.3/5.8	58.2/6.4	2.7/0.5	72.1/8.5	166.3/21.8
1975-80	42.4/6.5	64.3/7.2	4.5/0.6	81.7/8.8	192.9/23.1

ALMONDS

1970-75	0.1/(a)	(a)/(a)	0.4/(a)	16.6/5.5	17.1/5.7
1975-80	0.1/(a)	(a)/(a)	0.3/0.2	22.7/6.1	23.1/6.3

WALNUTS

No figures available.

Analysis of Constraints and Problems

Agroclimatic

The combination of excellent soils, adequate irrigation water and ideal frost-free climate is an advantage Pakistan has over many fruit growing regions of the world. Some localized climatical factors, such as hail at bloom time in the Murree district (23) may give a competitive disadvantage both regionally and nationally. Hail netting is used successfully in Mexico and Italy.

Technology

Consultant Ballard recognizes that the production of tree fruit in the NWFP is secondary to the production of the intercrops planted among the trees. The monetary returns for tree fruit per hectare are very low because of the low yields of saleable fruit. Low yields are attributed to (1) too few trees per hectare, (2) lack of tree pruning to stimulate a good bearing surface in the tree (3) lack of pruning to stimulate the production of better sized fruit and (4) loss of fruit due to biennial bearing, insect and disease injury.

The total apple situation is complicated with increased plantings of only two main varieties: Red Delicious and Golden. Very limited cold storage is available to handle the anticipated increase in planting and additional cold storage is not planned at the present time. Furthermore, the Government-run and privately owned storage plants are faced with tremendous electrical cost increases. There is no incentive at the present time to build for expanded future needs.

The harvest procedure also reflects the "secondary" attitude towards fruit production. The crop is sold to contractors for a fixed price prior to harvest. Since there are no grade standards for quality control, all edible fruit is channeled into the market. Cullage is fed to animals

Potential for Development

Varieties

The continual discovery of new germ plasms in the tree fruit field (world-wide) makes it desirable that the agricultural research institutes of Pakistan set up a positive means to be on the "receiving end." New strains of spur type apples, for example, have the potential to increase yields by 10 to 20% compared to the same varieties as non-spurs.

Walnuts and Almonds are grown in Pakistan but our team did not see Pecans, Filberts, Cashews or Pistachios. These may have local market potential and could certainly have export potential. Pakistan has thousands of miles of roads lined with shade trees. Walnuts and Pecans make strong shade trees as demonstrated by a few Walnuts along the roads in the Swat area. In addition to shade, the potential for nuts could be significant.

Improved Production Practices

The yields per hectare of tree fruits as shown in the statistics reveal very low figures which is probably due mainly to the wide spacing of trees. The production of all tree fruit in Pakistan could be tripled if grown in a non-competitive (no intercropping) high density planting where full attention is given to proper tree training, pruning, fertilization, irrigation, and pest and disease control. These average production figures illustrate Pakistan's potential for improvement:

<u>COUNTRY</u>	<u>TONNES PER HECTARE</u>
Pakistan	7.8
Washington State, U.S.	35.9
New Zealand	38.4

The maximum record yields for commercially grown Granny Smith apples in New Zealand exceeds 100 tonnes per hectare. Consultant Ballard sees no reason for some of the apple producing areas in Pakistan not to triple their average yields if the attempt is serious.

Improved Transportation System

Improved roads to expedite the farm-to-market produce in refrigerated trucks will be necessary if an export marketing goal is attained.

Scope of Work For Project Paper Design Team

Technical Studies

A good marketing board needs reliable updated statistics to be of value in giving direction to responsible people. For example, what is the potential yield of Red Delicious and Golden Delicious in 1987 -- only five years from now? How much cold storage is needed to properly protect this fruit for an orderly marketing period? Will the Pakistan markets take apples for 6 months, 8 months, or 10 months? Do the people in charge of cold storage know the exact requirements of temperature, air circulation, humidity and the removal of natural ripening esters for long storage? Will the marketing board have access to grade and quality standards which would have to be met in foreign market competition? Will the Marketing Board have access to world health information in regard to pesticide residues on fruit? What about pesticide safeguards for the farm workers? (e.g. Backpack spraying with bare feet and legs!)

Issues for Consideration of Design Team

What are the fruit crops grown best at specific regional areas which will give the growers in that area a competitive advantage? For example, an apple production area where maximum temperatures exceed 100 degrees F do not produce high quality summer apple varieties but can produce excellent quality winter apples. In Washington State the summers are too hot to permit MacIntosh to mature properly. The MacIntosh mature into soft poor keeping tasteless fruit. However in the late cool districts MacIntosh mature into their highest standard of quality. Do such climatical geographic differences exist in Pakistan? Are there geographic areas isolated and free of Codling Moth or other serious pests? (Such advantages are usually short-lived.) One of the comparative advantages Pakistan may have in the world apple market is its closeness to vast populations far remote from the competition of Europe, North and South America. Australia's Granny Smith will likely never be accepted by the Asian market because Asians seem to prefer a bland, sweet red apple.

Types of Expertise Required for Design Team

In the horticultural field of tree fruit there should be one who is knowledgeable in varieties and their market potential. It may be difficult to find one with the broad spectrum of deciduous, semi-tropical and tropical fruits. That person or persons should be knowledgeable in the use of instruments needed for the collection of data. Examples may include: recording thermographs, core thermometers, pressure testers, pH meters, soil augers, etc.

Orchard fertilization in the long run must be monitored with tissue analysis. Instrumentation for this kind of analytical work should be obtained for those qualifying researchers trained to use it. The design team member should be aware of the long-term scientific needs of a growing fruit industry.

Dr. Ronald V. Curtis, Eugene Babb and James K. Ballard visited the Quetta region of Baluchistan April 24-27, 1982

People visited included:

Chaudhry Zulfqar Ali Khan
Director of Agriculture

Pir Mohammad Khan
Director Deputy of Marketing

Dr. Hassan Jaffar
Director of Agricultural Research

Dr. Muhammad Saeed
Project Director of Fruit Development Project

Salceem Abbas Jilani
Chief Secretary of Planning and Development

Brigadier M. Usman Hassan
Secretary of Agriculture of Baluchistan

Dr. Farooqi & Mr. Usman Hassan
Baluchistan Forest Department

The absence of irrigation canals was obvious to Consultant Ballard as the airplane circled to land at Quetta. This gave the first hint of the major difference between NWFP and Baluchistan -- a shortage of water -- no running streams. All irrigation is done with water from wells. Some of these "wells" are called Karezes which are ancient underground "canals" built over 1,000 years ago, carrying mountain springs out to the flat valley agricultural land. There are about 360 Karezes in the Quetta region. The area receives an average rainfall of only 10 inches which can fall in heavy enough amounts to cause serious erosion. The Department of Forestry has launched a very impressive program of digging catch trenches on the upper slopes of the valley where run-off can be stopped. Several species of desert trees or shrubbery have been established in the bottom of these trenches. The first 70,000 of these catch-basins on about 4,000 acres were given a good test when 30+ inches of water fell in about

60 days of March and April of 1982. There was no runoff. The success of this program is the only hope for stopping the recession of the water table in the Quetta basin. However, tens of thousands of acres will have to be added in a long term project.

A visit with Brigadier Hassan, Secretary of Agriculture, revealed a firm opinion on his part that water conservation was the single most important problem facing the upper Baluchistan areas. In addition to the Forestry Department project to recharge the receding water tables, he expressed great hopes for a region-wide adaptation to trickle irrigation. Dr. Mohammad Saeed, Director of Fruit Development Research had a trial of micro-tubing trickle established at the Baluchistan Agricultural Research Institute for tree fruit. Consultant Ballard could see that the project needs to be expanded to include advanced trickle technology and recently developed trickle emitters. Ballard promised to send the appropriate commercial literature.

An assessment of the water shortage problem in the Quetta district may be more critical than realized by the farmers. Their water table is dropping 2 to 6 feet a year. A new (1974) power plant now makes it more attractive to install tubewell irrigation with electric pumps. This has caused a rapid increase in pumping. There are literally millions of acres of good land that could be developed if water were available. An overall water resource and utilization study should be developed to access the full potential in conservation with holding ponds and terraces as well as the maximum potential in opening new lands (more wells). It may be they are placing too much hope in the conservation potential of trickle. If every farmer changed over to trickle, the total district would be doing well if it stopped the lowering of the water table -- let alone raise it and permit new acreage expansion.

MAJOR CROPS IN THE BALUCHISTAN

Vegetables: Tomatoes, melons, chillies, peas, beans, cabbage, cauliflower, radish, carrots, okra, eggplant, cucumbers; summer and winter squash, spinach and watercress are the major vegetable crops grown on approximately 7,000 hectares with a total production of 74,653 tonnes.

Conversation with Dr. Hassan Jaffar, Director of the Agricultural Research Institute revealed comparatively poor quality and low yields were due to (1) inadequate water management (2) uncertified seed (3) low yielding varieties, (4) improper or inadequate use of fertilizer, (5) lack of modern production and marketing technology (6) inadequate pest and disease control (7) failure of Extension Service to put forth a good educational program. Dr. Jaffar worded it as, "Transmission of technical knowledge from research workers to the end users is not properly coordinated --." As is, it is a complete failure. It should be an integral part of the Research Institutes.

A visit to both the retail and wholesale markets astounds the western visitor with the obvious loss of produce due to the antiquated methods of handling. The infrastructure of their methods of harvest, transport, grading, wholesaling and retailing have probably not changed in several centuries. Any successful implementation of modern technology will come very slowly.

Fruit: The Quetta district fruit trees look like the trees of the NWFP in that they show no training or pruning. The major difference is closer spacing and no intercropping. This permits more bearing surface per hectare and therefore higher average yields (approximately 10 tonnes of apples per hectare compared to the overall national average of 7.8 tonnes per hectare). As in the NWFP apples dominate the fruit scene with Red Delicious and Golden being the two main varieties.

Plums, apricots and a few pears can be found. The climate and soils are ideal for tree fruit production. Spraying is sporadically done with very inadequate control of the codling moth, fruit flies and the flat headed wood borers. All of the problems of irrigation, fertilization and pest and disease control could be easily met with the introduction of improved technology. Chemicals are available in Pakistan but the systems of farmer education, product distribution and incentive will have to be changed before progress becomes evident.

Irrigation:

If trickle irrigation is successfully implemented by all the farmers several important steps will have to be taken. PVC pipe is available in Pakistan but distribution tubing and emitters are not produced. The requirements for full adaptation of trickle in the Quetta region would justify an extruding plant to manufacture emitters and tubing. But first, a successful demonstrational commercial farm will have to be established in each area growing fruit. From the airplane and reports this appeared to be many areas. There is no expertise available at the present time to see that these are properly installed. The micro-tubing system installed at the Agricultural Research Institute is not installed properly with respect to placement of the emitters. Furthermore, micro-tubing they are using is one of the most difficult to manage of the many types of emitters. The Quetta ARI should be on the receiving end of the latest developments in this field.

Marketing:

Fruit is sold to harvest contractors in the same manner as in NWFP, packed in the field in wooden boxes, taken to the Quetta market where the majority is trucked to Karachi. Some apples formerly went to Afghanistan prior to the Russian invasion. We were told some is exported to Iran and Saudi Arabia. However, statistics reveal more apples are imported into Pakistan than are exported.

Conclusion:

The overall potential of tree fruit production of apples in the NWFP and Baluchistan is enormous. If the present total infrastructure and system can be changed to adapt modern practices for production, harvesting and marketing, Pakistan could become one of the principal apple production countries of the world.

CONSULTANT'S REPORT ON

FRUIT AND VEGETABLE MARKETING IN PAKISTAN

I. INTRODUCTION

This report represents one phase of a short-term investigation of the fruit and vegetable industry in Pakistan with particular emphasis on the North West Frontier Province (NWFP). Other technical segments of this project have to do with fruit production and vegetable production. The following description is based mostly on a review of selected publications listed in the Annex of the overall team report. The material obtained from secondary sources, which are relatively numerous in this case, is supplemented by field interviews and personal observations which were necessarily limited by time available for field work. It is emphasized that this review is not intended to represent a complete description and analysis of the fruit and vegetable marketing system; rather, its purpose is to provide background for decisions on programs aimed at improving the structure. A broad approach is taken to definition of marketing; production inputs as well as the crops themselves are included.

NOTE: This section was prepared by Charles W. Peters, Agricultural Economist, during a stay in Pakistan extending from April 11 until May 3, 1982.

II. THE SETTING

Pakistan had a population of about 84 million in 1981 with 11 million being in NWFP (FATA excluded). Overall, the urban population represents some 28 percent of the total; in NWFP it is only about 15 percent.¹⁰ Per capita gross income was variously estimated at less than U.S. \$300 in 1979-80.¹ Most of the fruits and vegetables are grown in units that are less than 2 ha in size. Vegetables especially, tend to be grown in belts surrounding urban areas. Less than 5 percent of these crops are consumed on the farm or nearby village which means there is a substantial farm-to-market movement. It is estimated that the province has some 15,000 ha in fruits and 30,000 ha in vegetables with annual production of 160,000 M.T. and 350,000 M.T., respectively. There are some 650,000 farms in NWFP and about 100 primary markets.^{27, 33} With a few exceptions (to be noted later), these crops are sold and consumed in domestic markets. In the case of fruits, in particular, there is a heavy inter-regional movement from NWFP to other provinces of Pakistan. Certain vegetable crops such as tomatoes, onions, garlic and potatoes also move in volume to other provinces. Fruit and vegetable exports have not yet reached the point of being significant in the overall marketing pattern but may have the potential of becoming more important. All of the major markets in country are connected with the NWFP by surfaced highways and there is also rail service from most major shipping points, the exception being the high mountain valleys such as Swat. Farm-to-market roads, however, are generally either totally lacking or very limited and in poor condition.

III. MARKET STRUCTURE AND PRACTICES

1. Intermediaries

In Pakistan, as elsewhere, the "middlemen" are blamed for most of the problems experienced in the marketing of fruits and vegetables. Some of these allegations are undoubtedly based in fact and are justified; however, there is often a tendency to overlook or minimize the services performed by these intermediaries. At each stage from farmgate to ultimate consumer, there are necessary services performed by each handler; the real question is not how many or who may be involved but rather how well they are performing and at what cost. Pakistan and the NWFP are characterized by very small production units, numerous produce dealers, little market information, unregulated markets, limited credit and generally poor market facilities. The present market structure has evolved over the years from a barter-type economy to what is now a cash economy. Marketing has clearly lagged behind progress made in production of fruits and vegetables.

Fruit marketing in NWFP differs markedly from the manner in which most vegetables are handled. It is estimated that perhaps 85 percent of the fruits are sold to pre-harvest contractors; for vegetables the figure is only 5 percent. 33 These contractors often set up a two-year arrangement in order to reduce the risk of loss in case of a poor crop in any one year. They make cash advances to the growers on the contract price which is normally a lump sum. This credit varies in amount but is very important to the producer who must pay for inputs (fertilizer, chemicals, seeds, etc.) and cover family living expenses. In most of these sales the contractor will harvest and then pack the crop on the farm. In those cases where the contract method is not used, the channel is usually the traditional one

of selling the produce to local buyers in the villages or nearby towns; these local buyers then sell to retailers and vendors in the locality or send consolidated lots to the larger market centers. Commission merchants and jobbers operate in the larger wholesale markets and the auction method of selling is prevalent; this is said to be true even in the smaller markets. Products are not formally graded; the sales are made in individual lots with visual inspection by both buyer and seller. The relatively few processors and exporters of fruits and vegetables obtain their supplies of bulk materials through grower contracts or spot purchases on the farm or in the markets.

In transporting produce to first point of sale, growers use a variety of methods including "head carry", donkey, ox cart, bus, taxi and local trucks. Contractors and local assemblers, as well as dealers in the major markets, normally hire the larger trucks to move their goods. Brokers are often involved in arranging for the services of truckers. Tree fruits, except bananas, are usually packed in wood crates supplied by the buyer; this is done in the orchard. Bags are used for vegetable crops such as potatoes, dry onions and garlic, and tomatoes are placed in crates. For the most part, other produce is moved in bulk or in bunches. Weighing is done in the market by dealers or by weighmen. Storage of fruits and vegetables is very limited in most markets and waste through spoilage is said to be serious (10/15 percent). 5

2. Facilities

Fruit and vegetable markets in NWFP are generally characterized by very limited space, buildings in disrepair or poorly adapted, extremely unhygienic conditions and lack of organization. Still the markets function and are busy; they handle a substantial volume of produce. Very little mechanical

equipment is used; for example, porters do the loading and unloading. The buildings in these markets are perhaps best described as "assorted"; they are mostly small and do not provide floor space for storage. Much of the produce is stacked out-of-doors on the ground except where there may be retail stalls. The retail areas are superior to the wholesale markets so far as appearance and cleanliness are concerned. At best, it may be said that facilities for marketing fresh fruits and vegetables are minimal. The exception would be the cold storage plants that have been set up in NWFP. With the construction of 4 new cold storage plants by the Sarhad Development Authority, 2 added to existing private commercial plants, there is now excess capacity in light of immediate demands.

This condition of excess capacity will not persist for long if exports are expanded, storage for extension of season is increased, or seed potatoes are stored from season to season. Processing facilities for fruits and vegetables vary considerably in quality; in 1979/80 there were 7 such plants in NWFP. For the most part, their equipment is not new or efficient but the buildings are reasonably adequate. A new processing plant in the Tribal Areas is not proving successful; largely because it is poorly located in relation to both supply of produce and markets. There are 2 new grading plants for citrus in Peshawar but for a variety of reasons they have never functioned as planned.¹²

3. Prices and Margins

No element in the marketing process for fruits and vegetables is the center of greater controversy than the spread between farm and retail prices. In the view of the farmer, the middlemen are taking advantage of their superior bargaining position to

exact an unfair profit on the produce. The small farmers are, in fact, not in position to bargain effectively with the buyers who are better informed and often show evidence of collusion.¹⁵ Commission men in the markets have active associations through which they further their common interests and set charges. Farmers are not organized into groups for bargaining purposes; marketing cooperatives have not yet developed into an effective force. The cooperatives that have been set up in NWFP are mostly concerned with credit. Although most middlemen are themselves not large in terms of resources and quantity handled, they do have an advantage in dealing with growers who usually have units smaller than 2 ha and very limited financial means. In the absence of an effective farm credit system, this opens the way for undue dependence of the farmer on the dealers.

There are various estimates of the amounts absorbed by the several elements in the marketing system for fruits and vegetables. It is alleged that retailers may take as much as 50 percent of the consumer price and that farmers receive less than 35 percent.^{5, 25} It is also reported that intermediate middlemen and service agencies absorb 40/50 percent of the consumer rupee.²⁴ It is undoubtedly true that such amounts may be correct in some cases and at some times. In a detailed study of costs and margins for banana, mango, guava, chillies and onions it was found that the distribution of returns was as follows:

Retailers	11-25 percent
Assemblers/Wholesalers	12-19 percent
Service Agencies	24-35 percent
Farmers	29-49 percent

On the basis of this same study, farmers were receiving 11 to 24 percent of the retail price as their return over direct production costs.²⁴ This would indicate that there is a return to the grower for management and capital.

Little factual price information is available to most fruit and vegetable growers. At the local level, farmers depend mostly on friends and relatives for such information. There are some radio reports on market prices but these reports apparently reach only a limited number of rural people. In the primary and secondary markets, prices are established through auction by individual lots. To what extent there is agreement on prices (collusion) among buyers appears to be an open question. For the bulk of the tree fruit growers in NWFP, once the contract for their crop has been made, usually at a lump sum, the going market price is of little immediate concern. Such is not the case, however, for those growers who are selling their produce in the local markets as it matures. The fact of the matter is that the average grower has little knowledge of the marketing process, including prices, other than what he is being offered at a given time.

In a study of Punjab agriculture, it was concluded that the response of farmers to price changes has been large relative to world standards. If this is the case, then price policy has the potential of being a strong influence in determining cropping patterns. This same study found that inputs are allocated efficiently - peasant agriculture is "poor but efficient." 26

4. Regulation

Pakistan has the legal framework of a regulatory system for agricultural markets; this is contained in the Agricultural Produce Markets Act. Under the APMA, a number of marketing committees designed to supervise and regulate local markets were established in Punjab and Sind. Licensing of functionaries and control of market fees were contemplated as part of the program; dissemination of price and other market information was also contemplated. Marketing committees have not become operative in NWFP although one committee was set up. Even in Punjab and Sind they have not performed as expected. The legislation itself has not been defective but the implementation has been disappointing.^{5, 14} The Act was to provide for control of grading, especially for exports, but this phase of the program has not produced measurable results as yet. In general, it may be repeated that fruit and vegetable marketing in the NWFP is unregulated.

5. Cooperatives

As has been noted above, cooperatives have not been a significant force in the marketing of NWFP fruits and vegetables. Although more than 2,800 agricultural cooperative societies with over 117,000 members had been set up by mid-1970's, they have had little impact on the agriculture of the province. Mostly, they have been identified with loans and as a result, they have charged interest (Riba) which causes strong criticism. Despite an apparent need for cooperative action, farmers do not seem to have much faith in this mechanism as a means of improving their economic position; they are said to have joined only because this provides access to credit. Major

problems include too much internal friction, planning and execution at odds, weak leadership, low participation rates, no management training, debt collector image, government inputs program channeled elsewhere, under-capitalization and political bias in decision making. Study groups have pointed out the need to coordinate input and marketing functions in cooperatives; this would be in addition to involvement in credit.⁵

IV. DEVELOPMENT PROSPECTS

Proceeding on the assumption that there is a good potential for increasing fruit and vegetable production in NWFP, then it becomes critical to examine the prospects that the marketing and auxiliary services system can keep pace by upgrading the organization and capacity of that sector. Already, marketing is generally believed to have lagged seriously behind production at the present stage of development. Among the major factors that have a direct bearing on the future in marketing of NWFP fruits and vegetables are the following considerations:

1. Inputs needed by growers will need to be readily available at reasonable cost. Existing government subsidy programs on fertilizer and chemicals are to be curtailed or eliminated. This fact alone makes it essential that such inputs be distributed efficiently and with minimum costs and handling charges. Also, growers need to be assured of high quality products. Whether cooperatives could be utilized for this purpose is worthy of investigation. Alternatives are government or private channels.

2. To have any real hope of strengthening the bargaining position of the farmer vis-a-vis the "middlemen", there will need to be access to credit and perhaps cooperative marketing on a broad front. There does not appear to be conclusive evidence that overhauling of the structure will materially reduce marketing costs; however, the answer here will not be known until another approach is tried or changes are made in present procedures. Little is gained through continuing the ongoing battle of words between middlemen and their numerous critics; it may be time at least to try another approach. In any event, the present system will not be changed materially until an alternative is available.
3. Currently, the image of cooperatives is not too favorable. While it would be a serious error to set up cooperatives that would be multi-purpose (marketing, inputs, credit) simply to create more cooperatives, it may be that such organizations have merit as one viable alternative in overcoming marketing problems. Multi-purpose farmer associations have been very successful in some Asian countries. They are worthy of consideration in Pakistan.
4. Export prospects for NWFP fruits and vegetables, especially in nearby Asian and Mid-East markets, can be improved if price and quality are competitive. In 1980/81 the principal buyers were Dubai, Saudi Arabia and Kuwait. In 1979/80 the largest single market was Iran. In 1979/80, exports of fruit products were 73,000 M.T. (mostly citrus, bananas and other tree fruits) and vegetables totaled almost 125,000 M.T. (potatoes, onions, chillies, garlic); the value of these exports was about

Rupees 460 million.¹⁰ Exports have had a tendency to fluctuate considerably from year to year.

As production increases, there should be supplies of these products available for export; apples may be a good example. Processed products such as preserves, condiments, juices and dehydrated fruits and vegetables may also have a potential. In considering the outlook for exports, it must be remembered that the domestic market will itself require larger quantities, particularly in light of rapid population growth and hoped-for increases in per capita income. Government of Pakistan policy at present is to restrict export of produce that is in short supply in-country. On a selective basis, however, there should be scope for increasing sales abroad. Also, there is a real opportunity to displace certain imports of fruits and vegetables; apples, melons, nuts and potatoes are possibilities.

5. Processing of fruits and vegetables in NWFP is now centered on canning and dehydrating products for the Pakistani armed services. This activity is centered on dehydration and canning of vegetables; including potatoes, onions, cabbage, carrots and okra. Commercial production of other items is limited largely to preserves, juices, squash and condiments. These latter products are sold in the urban markets where the income level is higher. Only very limited quantities of fruits and vegetables are canned for the commercial market; one reason being the very high cost of materials such as cans and sugar (for example, 29 oz. cans were Rs. 4.5/5.0 each and sugar Rs. 8/10 per Kg. in 1982). Even the market for juices and squash

is said to be shrinking because of increasing competition from fresh fruits. The entire problem of the industry is compounded by the lack of modern, efficient equipment in the processing plants and the inability of most Pakistanis to pay the price of processed goods. Another consideration is the availability of fresh produce during most of the year. There may be a limited potential for increasing exports of NWFP products such as preserves and juices; also, there may be some demand for dehydrated products. In the immediate future, however, processors are not expected to absorb more than a minor part of the fruit and vegetable output.

6. It has been emphasized by many observers that fresh fruits and vegetables are not graded in the NWFP, or in Pakistan as a whole. Grading in itself would likely not alter procedures greatly in a marketing system based upon personal, visual inspection of the produce by buyers and sellers; furthermore, grading would likely increase marketing costs in the short run. Neither facilities nor expertise are available and no specifications have been established. A limited legal base exists in the Agricultural Produce Markets Act. There is now informal grading at various stages from producer to consumer in the domestic market. Although in present circumstances, grading would have limited impact in the local markets, it would be essential in developing the export outlets. Not only grading to specification, but also improved packaging will be required in this trade if Pakistan's fruits and vegetables are to be competitive.

7. Transportation from primary to central markets does not appear to be a major constraint in developing the fruit and vegetable industry of the NWFP as it now operates. Main roads are satisfactory and trucks seem to be plentiful; the railroad also serves some of the province. An efficient truck service is operated by the National Logistic Cell (NLC); this is in addition to the many private trucks for hire. At present, there is no refrigerated transport available; this will be needed if export trade is expanded. Construction and improvement of feeder roads would facilitate the movement of produce from far to initial market. Where vegetables, and fruits as well, are produced in close proximity to market centers, transportation is not a serious problem but in the NWFP, many growing areas are not near large markets.
8. Construction and/or upgrading of market centers, along with general improvement of the environment in the markets, would make some contribution to marketing efficiency. There is a question as to how this action would affect costs and margins in the marketing process. Experience in many cases has proved that it is more effective to build upon and improve existing centers in lieu of establishing new markets in unfamiliar locations. This does not affect the need for new market centers where there have been none before. These market centers will need to be subject to at least minimum basic regulation in order to clarify trading procedures and to reduce questionable practices such as short weighing, non-payment, excessive charges, misinformation, etc.

9. Storage space for fresh produce is very limited in the NWFP. In part, this may be a logical result of limited demand for such space. Four new cold storage plants in the province are operating far below capacity; this despite a subsidized rate which is giving real concern to privately operated plants. The usual practice of produce dealers seems to be to move produce through the channels as rapidly as possible. There is a probability, however, that more attention will be given to use of storage as a means of lengthening the marketing season or of holding commodities for planting (seed potatoes, for example). Where fruits and vegetables, such as apples and other tree fruits, are to be exported, there will be need for appropriate storage facilities if quality is to be maintained. If the export trade is to be developed significantly, it will also be necessary to provide refrigerated transport to Karachi and additional cold storage space at the port as well.
10. Increased availability and effective handling of inputs is an important element in developing the fruit and vegetable industry of the province. This is especially necessary in light of the curtailment expected in government programs for fertilizer and chemicals. The marketing of inputs should progress hand-in-hand with improvement of the system for marketing the commodities produced. It may be possible to utilize some of the same channels for handling both inputs and commodities; multi-purpose associations are one alternative.

V SCOPE OF WORK FOR DESIGN TEAM

In light of the foregoing review of the the marketing structure and practices and the development prospects for fruits and vegetables, there are a number of issues that will need to be given concentrated attention in designing a project aimed at upgrading the fruit and vegetable marketing system of the NWFP. The following comments are intended to indicate the extent of present knowledge and the need for further investigation of areas that will necessarily be considered by a design team.

1. The relative merit of alternatives in developing the operating program of a proposed Fruit and Vegetable Development Board (FVDB) for the NWFP will need to be examined in detail. At present, there is uncertainty concerning several key aspects of the FVDB; for example, to what extent, if any, will the Board engage in price support or stabilization activities, should produce be graded and inspected, what type of research and extension activities will the FVDB undertake, what controls should be applied to middlemen, etc. Basically, the issue is whether the Board should venture beyond being a regulatory and service agency.

2. Numerous reports are now available detailing the structure of the marketing system; however, the available data do not provide complete information on numbers of intermediaries and their charges for services. Likewise, little specific information is available on marketing costs and margins. It is suggested that the design team select a limited number of perhaps six major items and run a spot check on prices at the various stages from farm to consumer. A full scale study of costs and margins is something that may be undertaken under auspices of a long-term project.

3. It is obvious that the present marketing system will not change until an alternative is available. The design team should consider among other possibilities, the use of multi-purpose cooperatives for marketing of both crops and inputs, as well as the channeling of credit. Another aspect of this same question is the Government of Pakistan policy on price support or stabilization along with subsidies on inputs. Past performance and the outlook for the future will need consideration.
4. An analysis of present and prospective demand in both domestic and export markets for NWFD fruits and vegetables is required; processed items are to be included. This review would cover the inter-regional movement, size and seasonality of the flow to principal outlets and measures required to facilitate exports. Grading, transportation and storage are factors influencing export prospects. Some data are presently available in this area of concern but additional study is required.
5. Transportation and storage of produce will need consideration. The information now available is mixed; for example, it is not difficult to obtain data on availability of and rates charged by trucks and other carriers. Also, the amount and cost of cold storage are known but there is little information on dry storage. The availability and adequacy of both transportation and storage needs to be considered by the team.
6. Marketing information, research and extension are areas in which little or nothing is being done by the Government of Pakistan or others at present.

The team will need to consider the scope of such programs and the means of providing such services if they are to be an integral part of the proposed project.

7. While it would be helpful for the team to have data on production costs, this type of data is generally not available for fruits and vegetables and would require a long-term study to produce significant results. A number of measures that may be initiated to improve marketing are not contingent on production costs; thus, the lack of such data need not be a serious impediment. Over time, cost research in both production and marketing is highly desirable. The comparative advantage of the alternative crops should be given consideration; cost data are required in the evaluation.
8. Training needs in developing at least a core of professional marketing people in the NWFP are to be evaluated. This exercise would focus on the in-country prospects for increasing the availability and quality of such training. Need for sending people abroad to obtain training is also a concern of the design team. Certain of the colleges and universities in Pakistan are now offering work in marketing; the feasibility of strengthening this program is to be considered. To date few people have received professional training in agricultural marketing. Primary attention in a training program would be given to the strengthening of the newly organized marketing division of the FVDB.

To repeat what has been said elsewhere in this report, much work has been done previously in the general field of marketing agricultural products

in Pakistan. While the reports of these studies leave some gaps in evaluation of the market structure, they do provide a good source of background information that can be utilized in further investigations.

VI. TYPE OF EXPERTISE REQUIRED FOR DESIGN TEAM

The team should have two marketing people for the duration of the design process; presumably 60 to 90 days. In addition to these two team members, there should be as many as four local persons available to assist in collection and evaluation of data. The two experts suggested would be:

1. Agricultural Economist: This person would have a broad base of experience in fruit and vegetable marketing with a research orientation; an M.S. or Ph.D. plus considerable experience is needed. He would be expected to design and conduct the several short-term investigations required to round out the marketing information needed by the team.
2. Fruit and Vegetable Marketing Specialist: This person needs training and experience in the marketing of both fresh and processed fruits and vegetables. He should be knowledgeable in the physical aspects of marketing as well as in extension-type activities such as market information, cooperatives, credit and input distribution. In this case experience should be given priority over scholastic qualifications. A B.S. or M.S. degree plus extensive experience would suffice.

VII. PROPOSED REMEDIAL ACTION

In an effort to realize the potential of the fruit and vegetable industry, the NWFD is proposing to create a Fruit and Vegetable Development Board (FVDB) which would become operative July 1, 1982. The FVDB is to be controlled by representatives of the provincial government, private business and farmers; the NWFP Minister of Agriculture will be the chairman of the group. As planned, the Board will take

in Pakistan. While the reports of these studies leave some gaps in evaluation of the market structure, they do provide a good source of background information that can be utilized in further investigations.

VI. TYPE OF EXPERTISE REQUIRED FOR DESIGN TEAM

The team should have two marketing people for the duration of the design process; presumably 60 to 90 days. In addition to these two team members, there should be as many as four local persons available to assist in collection and evaluation of data. The two experts suggested would be:

1. Agricultural Economist: This person would have a broad base of experience in fruit and vegetable marketing with a research orientation; an M.S. or Ph.D. plus considerable experience is needed. He would be expected to design and conduct the several short-term investigations required to round out the marketing information needed by the team.
2. Fruit and Vegetable Marketing Specialist: This person needs training and experience in the marketing of both fresh and processed fruits and vegetables. He should be knowledgeable in the physical aspects of marketing as well as in extension-type activities such as market information, cooperatives, credit and input distribution. In this case experience should be given priority over scholastic qualifications. A B.S. or M.S. degree plus extensive experience would suffice.

VII. PROPOSED REMEDIAL ACTION

In an effort to realize the potential of the fruit and vegetable industry, the NWFD is proposing to create a Fruit and Vegetable Development Board (FVDB) which would become operative July 1, 1982. The FVDB is to be controlled by representatives of the provincial government, private business and farmers; the NWFP Minister of Agriculture will be the chairman of the group. As planned, the Board will take

over and operate the provincial research and extension activities relating to fruits and vegetables; also, it will set up a marketing division. The purpose is to operate an integrated action program aimed at both production and marketing of fruits and vegetables. Details of how the three activities will be set up and what their functions will be have not yet been resolved. It is clear, however, that marketing will be a new project; there are now no research and extension workers in this subject-matter field; the NWFP has only one marketing officer. Apparently, it is not intended for the FVDB to engage directly in the buying and selling of produce for purposes of price support or stabilization. This type of trading operation is contemplated by the newly organized Agriculture and Storage, Ltd. which has been set up by the Federal Cooperative Bank. Assuming that the NWFP Fruit and Vegetable Development Board will be the medium used in efforts to improve marketing, there are a number of suggestions and recommendations on functions that may be considered as the program evolves and the plan of work is launched; included are:

1. Advisory assistance to farmers, produce dealers, processors and others. This could include technical advice and demonstrations of improved handling procedures. Packaging and transport are other subjects.
2. Licensing and/or supervision of market intermediaries. The aim here would be to control buying and selling practices including weighing, settlement of accounts and charges for services rendered. Monitoring of contracting procedures would be an important part of the job.
3. Establishing and supervising the grading of produce (where needed). Specifications would be developed

for the various commodities, especially those for export. Grading and inspection procedures would be supervised by the Board.

4. Initiating and operating a continuing market information program. Prices in various locations would be publicized on a current and timely basis. Supply and demand outlook for the fruit and vegetable crops would be prepared and issued to growers, dealers and others. One objective would be to stabilize prices and prevent surplus situations.
5. Providing or arranging for public market facilities. This could range from country assembly points to weighing stations in the markets. Other examples might be packing sheds and auction centers.
6. Encouraging joint action by farmers. Multi-purpose associations offering marketing, input supply and credit services are a possible form of action. Single-purpose cooperatives and even farmer's clubs also have merit; the form of organization should be tailored to the objectives and the local situation.
7. Distributing or arranging for distribution of production inputs. Obviously, the quantity and quality of inputs such as fertilizer, chemicals and seeds have a very distinct influence on the production of fruits and vegetables. Quality control through licensing and/or inspection could be a very significant contribution of the Board. One current example of what the FVDB might do is to lead the way in setting up a mechanism for carrying seed potatoes over in Swat from one season to the next; thus avoiding the importation of seed from Europe.

8. Investigating export potential as well as prospects for import substitution. If the NWFP can assure overseas buyers a stable supply of proper quality at competitive prices, there should be an export market for increasing quantities of fruit and vegetable products. The Gulf area as well as adjoining countries are potential buyers. There is a question whether the NWFP would be able to displace most fruit and vegetable imports; seed potatoes, melons and tree fruits are certainly an exception. In any event, the foreign trade in such commodities is deserving of continuing study.
9. Initiating and conducting applied marketing research. Too little factual data are available on the handling of produce in NWFP and for that matter, in all of Pakistan. Problem-solving type of research is needed on such subjects as:
 - a. costs and margins in relation to services rendered,
 - b. prices and the price making mechanism,
 - c. effectiveness of and need for market information,
 - d. justification for grading and standardization,
 - e. how best to distribute inputs and credit, and
 - f. market potential at home and abroad.
10. Setting up and operating an extension program in marketing that would be aimed primarily at improvement of produce handling practices and more efficient distribution of inputs. Dissemination of market and price information would also be a function.

VIII. IMPLEMENTATION OF PROGRAM

It would not be realistic to expect the marketing division of the new Board to attempt all of the suggested lines of work immediately. After a judicious examination of the various possibilities, it will undoubtedly be a case of doing first things first. This would not imply, however, that the broader, more complete program should be forgotten. If such were the case, part of the justification for a development board would be lost. In the drafting and implementation of a work plan for the marketing sector, the Board will probably be able to utilize considerable outside assistance. This is especially likely where a unit must be built from the ground; such is the case here so far as marketing is concerned. As a nucleus of technical assistance, consideration may be given to three experts in the marketing field:

1. Marketing Economist - a broad-gauged person with education in agricultural economics and business plus substantial experience in the marketing of fruits and vegetables.
2. Food Technologist - a person trained in the processing of foods with experience in fruits and vegetables. Some knowledge of marketing is desirable.
3. Marketing Specialist - an extension-type person with a broad knowledge of marketing procedures for fresh produce in particular. Some knowledge of input distribution is advantageous. The Marketing Economist would serve as counterpart to the director of the marketing division of the Board; he would also serve as leader for the team of experts in this field. It would be anticipated that the FVDB might have separate sections to deal with fresh and processed products; the Food Technologist and the Marketing Specialist would be attached to the appropriate section (s).

From time to time the resident team of three in the marketing unit would be supplemented by short-term consultants. Among the subject matter areas in which such consultants might be required or desirable are:

1. Grading and packaging.
2. Market information and extension methods.
3. Marketing research, including evaluation of domestic and export markets.
4. Farmer organizations, including multi-purpose associations.
5. Storage and transportation.
6. Design and construction of market centers.

In addition to the usual logistic support required to field and maintain technicians, it is suggested that consideration may immediately be given to a limited number of pilot projects that the Board might sponsor with outside financial assistance:

1. One very promising project involves the purchase of seed potatoes from Swat farmers at harvest and then holding this seed stock in cold storage until the next planting time. This would prevent the sale of good quality local seed in the markets for table use; most farmers cannot afford to hold the seed themselves. They often sell their potato seed and then later buy imported seed at a much higher price. In this activity the FVDB would sell seed potatoes back to the farmers at cost plus storage and handling charges. A revolving fund of perhaps Rs. five million would be needed for a program involving 1,500 M.T. of seed potatoes. Any such program should be coordinated with the on-going activities of the Federal Seed Certification Department.

2. Another pilot project that may be considered by the Board would involve the setting up and operation of a buying station for fruits and the use of cold storage to extend the marketing season. Another possibility here is to utilize the fruit packing plant in Peshawar that has never been really operative. Apples, citrus, apricots, plums, and pears for both domestic and export markets may be purchased, packed, stored and sold on a demonstration basis. Funding might be in the range of Rs. 2 to 4 million. This project, along with the one for seed potatoes, should be largely self-liquidating. Supervision of these trials may be assigned to the resident advisors in the beginning.

3. Under FVDB auspices, the food technologist might conduct a pilot project on extraction and concentration of fruit juices and the dehydration of both fruits and vegetables. This work could likely be channeled through the food processing lab at the Tarnab Agricultural Research Institute near Peshawar. It is suggested that about Rs. 2 to 4 million be allocated initially for equipment and operating costs. This activity would be in the nature of research and demonstration; it would not be self-supporting.

4. A fourth marketing project to be undertaken by the FVDB, with both technical and financial assistance, would involve in the beginning the design, construction and possibly, operation of 2 primary market centers at strategic points not now served by such markets. These new market centers would be intended to provide a service for growers, buyers and consumers in the

adjoining areas and to serve as demonstration units. An initial allocation of Rs. 4 million is suggested as an order of magnitude estimate of cost. A logical further step in this activity would be the improvement of 2 existing markets. This upgrading would involve the provision of common facilities such as weighing, auction area, loading and unloading platforms, etc. Another Rs. 2 million would be needed to initiate this proposal.

If implemented, the program outlined would certainly give the new FVDB an opportunity to lay the foundation of a continuing program for NWFP fruit and vegetable crops. While not all-inclusive, the proposal is sufficient to have an impact and it is manageable.

LIST OF REFERENCES

1. PAKISTAN, ECONOMIC DEVELOPMENTS AND PROSPECTS; World Bank, 1981.
2. A REVIEW OF UNITED STATES DEVELOPMENT ASSISTANCE TO PAKISTAN 1952-1980; Jeffalyn Johnson and Associates, Inc. for A.I.D., 1981.
3. BASIC DEMOCRACIES AND RURAL DEVELOPMENT IN PAKISTAN; Nicholson, N.K. and Khan, D.A., Cornell University; 1974.
4. ASSISTANCE TO THE PAKISTAN AGRICULTURAL STORAGE AND SERVICES CORPORATION By E.J. Barker, et. al.; F.A.O. Rome, 1980.
5. AGRICULTURAL ENQUIRY COMMITTEE REPORTS; Ministry of Food and Agriculture, Government of Pakistan, Islamabad, 1975 (a series covering most aspects of production).
6. AGRICULTURAL STATISTICS OF NORTHWEST FRONTIER PROVINCE 1975-76 to 1979-80 (Agriculture Department) NWFP, Peshawar 1981.
7. FRUIT, VEGETABLE, AND CONDIMENT STATISTICS PAKISTAN; Food and Agriculture Ministry, Government of Pakistan, 1980.
8. PAKISTAN'S POTENTIAL FOR EXPORTING FRUIT, VEGETABLES, AND VEGETABLE PRODUCTS, By Marion F. Ward, USAID, Pakistan, 1972.
9. RECOMMENDATIONS FOR AN ACCELERATED POTATO IMPROVEMENT PROGRAM IN WEST PAKISTAN By John S. Niederhauser, Rockefeller Foundation, 1967.
10. AGRICULTURAL STATISTICS OF PAKISTAN 1980; Ministry of Food, Agriculture and Cooperatives, Government of Pakistan, Islamabad, 1981.
11. SURVEY OF AGRICULTURAL MARKETING IN WEST PAKISTAN By Floyd F. Hedlund and Marion F. Ward, 1968.
12. DEVELOPMENT OF AGRICULTURAL MARKETING IN PAKISTAN - A FINAL REPORT OF PROJECT COORDINATOR, USAID Pakistan, 1977.
13. REPORT ON A TRIP TO PAKISTAN WITH RECOMMENDATIONS FOR ACTION ON A MARKETING PROGRAM By Everett J. Young, Consultant A.C.D.I., Washington, D.C. 1969
14. AN EVALUATION OF AGRICULTURAL MARKETING (with special reference to Sargodha Division) By Ali M. Chaudry, et. al. West Pakistan Agricultural University. 1970.

15. THE AGRICULTURAL ECONOMY OF NORTH-WEST FRONTIER By Nurul-Islam Mian, Peshawar University, 1970.
16. REPORT OF THE FOOD AND AGRICULTURE COMMISSION; Ministry of Food and Agriculture, 1960.
17. REPORT OF THE AGRICULTURAL EXPERTS COMMITTEE FOR BALUCHISTAN; Pakistan Agricultural Research Council, 1979.
18. FRUIT DEVELOPMENT IN BALUCHISTAN; Planning Commission, Government of Pakistan, 1978.
19. IMPROVEMENT OF POME AND NUT FRUITS IN NORTHERN AREAS OF N.W.F.D. PAKISTAN FINAL REPORT, Agricultural Research Institute, Tarnab, 1979.
20. RESEARCH HIGHLIGHTS 1980, Agriculture Department, Agricultural Research Institute (Swat) N.W.F.P., 1981.
21. RESEARCH HIGHLIGHTS 1981, Agriculture Department, A.R.I. (Swat) N.W.F.P. 1982.
22. CONSULTANCY REPORT AND RECOMMENDATIONS FOR HORTICULTURAL DEVELOPMENT IN THE BUNER AREA, SWAT DISTRICT, NORTH-WEST FRONTIER PROVINCE By G. Tamponi, F.A.O., Rome, 1980.
23. CONSULTANCY REPORT AND RECOMMENDATIONS FOR DECIDUOUS FRUIT DEVELOPMENT IN PAKISTAN By David L. Creech, U.S.A.I.D., 1981.
24. ESTIMATION OF MARKETING MARGINS AND MEASUREMENTS OF SEASONAL PRICE VARIATION OF SELECTED AGRICULTURAL COMMODITIES IN SIND PROVINCE OF PAKISTAN By M. Joaha Qureshi, Sind Agriculture College, 1974.
25. FRUIT AND VEGETABLE PROCESSING INDUSTRY IN NORTH-WEST FRONTIER PROVINCE, By Fazal Rahim, University of Peshawar, 1972.
26. RELATIVE PRICE RESPONSE, ECONOMIC EFFICIENCY AND TECHNOLOGICAL CHANGE: A STUDY OF PUNJAB AGRICULTURE By Walter P. Falcon and Carl H. Gotsch, Howard University, 1969.
27. DEVELOPMENT STATISTICS OF N.W.F.P. 1980; Planning & Development Department, Bureau of Statistics.
28. FOOD PRODUCTION INCREASE IN WEST PAKISTAN PROBLEMS & EFFECTS By C.M. Sharif, Pakistan Academy for Rural Development, Peshawar, 1970.
29. IMPROVING MARKETING SYSTEMS IN DEVELOPING COUNTRIES, U.S.D.A. 1972.

30. THE POTENTIAL FOR SEED POTATO PRODUCTION DURING THE AUTUMN SEASON IN THE PUNJAB By Ch. Altaf Hussain, ARI, Lyallpur.
31. AGRICULTURAL MARKETING BOARDS THEIR ESTABLISHMENT AND OPERATION: F.A.O. Rome, 1966.
32. REPORT OF THE FAO/DSE NATIONAL SEMINAR ON RURAL MARKET DEVELOPMENT IN PAKISTAN; Ministry of Food, Agriculture, and Cooperatives; Government of Pakistan, 1980.
33. REPORT ON THE SURVEY OF RURAL MARKETS IN NORTH WEST FRONTIER PROVINCE: FAO/DSE National Seminar on Rural Market Development in Pakistan. Ministry of Food, Agriculture and Cooperatives; Government of Pakistan, 1980.
34. SCHEME FOR THE PRODUCTION OF BASIC AND CERTIFIED SEED POTATOES IN PAKISTAN. Revised Draft PCI. 37 p.
35. STATISTICAL BULLETIN - VOL. 29, August 1981 No. 8. Statistical Division, Government of Pakistan.
36. VEGETABLE FARMING SYSTEMS IN CHINA. Edited by Donald L. Plucknett and Halsey L. Beemer, Jr. Westview Press; Boulder, Colorado, 1981.
37. KNOTT'S HANDBOOK FOR VEGETABLE GROWERS, 2nd Edition. By O.A. Lorenz and D.N. Maynard. John Wiley and Sons; N.Y. 1980.

LIST OF ORGANIZATIONS AND PEOPLE INTERVIEWED

Ronald Curtis,
Agriculture and Rural Development Officer,
USAID/P

Ray Carpenter, Agriculture Officer
USAID/P

Mohammed Suliman,
Horticulture Consultant
USAID/P

Faridullah K. Wazir
Horticulturist,
ARI, Swat

Mohammed Afzal Khan
Former Minister of Agriculture,
NWFP

Shujaat Ali Khan
Minister of Agriculture,
NWFP

Sahibzadah Mohammad Ayaz
Secretary of Agriculture
NWFP

Dr. Inayatullah
Director of Extension
NWFP

Abdul Qadim Syed,
Director Agriculture Research Institute
Swat

Richard Scott,
Development Officer
AID/Washington

John Philips
FAO Country Representative,
Islamabad

Tariq Durrani
AID Liason Officer
Peshawar

Ralph Atkinson,
FAO Planning Advisor
Ministry of Agriculture
NWFP

LIST OF INTERVIEWEES IN QUETTA

Chaudhry Zulfqar Ali Khan
Director of Agriculture Extension

Pir Mohammad Khan
Director Deputy of Marketing

Dr. Hassan Jaffar
Director of Agricultural Research

Dr. Muhammad Saeed Khan
Project Director of Fruit Development Project

Saleem Abbas Jilani
Chief Secretary of Planning and Development

Dr. Farooqi and Mr. Islam
Baluchistan Forest Department

Mohammad Sami Usmani
Food Technologist

Kamal Khan
Vegetable Botanist

Mohammad Sadiq Khan
Potato Botanist

Abdul Haq
Horticulturist

PEOPLE INTERVIEWED AT
AGRICULTURAL RESEARCH INSTITUTE, TARNAB

Habibullah Khan
Horticulturist

Rafiullah Khan
Food Technologist

Iftiqar Khan
Horticulturist

Ajab Khan
Assistant Food Technologist

Muhammad Jawaid Durrani
Research Officer

Mohammed Waheedullah
(Vegetable) Research Officer

Habib-ur-Rehman
Agriculture Chemist

PEOPLE INTERVIEWED IN KARACHI

K.A. Siddizi,
Marketing Adviser
Ministry of Agriculture
Food & Cooperative

Siraz-ui-Hasan
Dep. Marketing Adviser
Ministry of Agriculture
Food & Cooperative

S. Noor Ahmad
Dep. Marketing Adviser
Ministry of Agriculture
Food & Cooperative

Akhtarul Islam Khan
Director
Export Promotion Bureau

Habibur Rehman
Investigator
Export Promotion Bureau

Basharat H. Zaidi
Rural Development Officer
USAID/K

INTERVIEWEES

Imtiaz Hussain
Agriculture Development Commissioner
M/O Food, Agriculture & Cooperatives
Islamabad

Mohammad Mohsin
Joint Secretary (Food),
M/O Food, Agriculture and Cooperatives
Islamabad

Ghulam Rabbani
Managing Director, PASCO
Pakistan Agriculture Service Company (PASCO)
Islamabad

Ajmal Chaudry
General Manager
Agricultural Marketing and Storage, LTD.
Islamabad

Ghulam Habib
Technician
Food Processing Industry
Nasarpur, Peshawar

Abdul Qadim Syed
Director
Agricultural Research Institute
Swat, NWFP

Taj Mohammad Khan
Deputy Director
Export Promotion Bureau - Ministry of Commerce
Peshawar

Shaukat Elahi
Managing Director
Erum Cold-Storage & Ice Factory LTD.
Peshawar

Javed Saifullah Khan
Managing Director
Saif International Combine LTD.
Peshawar

ITINERARY OF TEAM FOR MARKETING, ETC.
OF FRUITS AND VEGETABLES

April, 1932

- Monday 12: Team arrives Islamabad.
Stay in Holiday Inn
- Tuesday 13: Discussions with USAID (ARD) staff.
- Wednesday 14: Proceed to Peshawar by road. 07.30. Arrival
11.00 hrs. Stay in Hotel Intercon.
Discussions with Secy. Agriculture and Mr.
Atkinson. 11.30 - 13.30.
Discussions with FATA Staff 14.30 - 16.00
- Thursday 15: Visit Agr. Res. Inst. Tarnab - 08.00 - 10.00
Visit Fruit Processing Factory, Nansarpur,
10.30 - 13.30
- Friday 16: Visit country side
- Saturday 17: Visit K.K. Fruit Processing Factory,
Peshawar. 08.00 - 11.00
Visit Cold Storage Plants, Peshawar.
11.30 - 13.30.
Visit Fruit and Vegetable Market. 08.00 - 10.00
Visit Fruit and Vegetable Production Areas.
10.00 - 17.00 near about Peshawar.
(Lunch Boxes may be carried with)
- Sunday 18: Proceed to Malakand and Swat by road - 08.00
Arrival 11.30 hrs. Stay in Swat Hotel.

Best Available Document

Monday 19: Visit Agr. Res. Inst. Mingora; production areas and study marketing, packing, transportation system in Swat and Malakand Agency.

Tuesday 20: Proceed to Islamabad by road 08.00 hrs. Arrival 13.00 hrs. Stay Holiday Inn.

Wednesday 21:)
to) Stay in Islamabad.

Saturday 24:)

Sunday 25: 1. CHARLES PETERS) Proceed Karachi 10.45 PK-501
2. RONALD MORSE) Arrive Karachi 12.35

Monday 26: Discussions with Mr. K. Siddiqui, Agr. Marketing Advisor.
Dep: Karachi 19.30 PK 314
Arr: Islamabad 21.15.

Saturday 24 1. EUGENE BABB) Proceed Quetta via Lahore
2. JAMES BALLARD) Dr. Curtis and Mr. G.M. Mari will accompany

Dep: Islamabad 10.45 PK 607
Arr: Lahore 11.45
Dep: Lahore 13.15 PK 321
Arr: Quetta 14.35

Stay in Staff House.

Sunday 25 Discussions with Secy. Agriculture. 09.00 - 11.00

Monday 26: Visit Agr. Res. Inst. Fruit Processing Plant and orchards. Discuss problems of fruit and vegetable production, packing, transportation, etc; with officers concerned of Agriculture, Marketing and cooperative departments. Program to be arranged by Director of Agriculture Department.

Tuesday 27: Proceed Islamabad 11.10 PK 324. Arrive 12.30 Stay Holiday Inn.

Wednesday 28: Discussions with Chairman PARC 09.00 - 10.00
Discussions with J.S. (Food) and Agr. Development Commissioner. 10.30 - 12.00
Discussions with Managing Director PASSCO Holiday Inn, Islamabad 12.30 - 14.30.

Thursday
April 29 through
Thursday
May 6: Wrap up and prepare preliminary report. Islamabad.